*News about*

# B.F.Goodrich Chemical *raw materials*

★ new high-tack Hycar

★ specification compounding

★ liquid GR-S polymer

**One of the new applications** *of Hycar American Rubber is for the liner sections of a centrifugal separator. Here Hycar withstands an abrasive stream of sand and mud, plus entrained oil and gas.*

**NEW HIGH TACK HYCAR COMPOUND FOR SPECIAL USES.** Hycar 1042 has recently been developed for applications requiring a high building tack—drum and tank linings, roll building, hose fabrication, etc. The improved tack is a result of the combined action of Plasticizer KP-555 and Hycar 1312, a liquid nitrile polymer. Hycar 1312 also improves knitting of stocks during molding and curing. A filler with a long needle-like structure (Pyrax A) inhibits blistering by allowing the escape of air during the calendering operation.

Compounding is not critical, and ingredients can be modified within fairly flexible limits to obtain physical properties desired for the application. The following recipe is recommended as a basic formulation for high tack compounds:

| | |
|---|---|
| Hycar 1042 | 100.0 |
| HBS Zinc oxide | 5.0 |
| Sulfur | 2.5 |
| FEF Black | 40.0 |
| Pyrax A | 20.0 |
| Hycar 1312 | 20.0 |
| KP-555 | 20.0 |
| TMTM | 0.6 |
| NBS Stearic acid | 1.0 |
| | 209.1 |

Note: Compound possessed very good tack.

**SPECIFICATION COMPOUNDING TO MEET DIFFICULT PRODUCT REQUIREMENTS.** Despite the fact that the Hycar nitrile rubber family includes a broad range of types, requests for specialized properties are continually received. This is where our Product Application Laboratory steps in to develop and evaluate specialized compounds. Two recent such developments are of interest:

**A low-swell, oil-resisting compound** was requested for an accumulator bladder for hydraulic pressure systems. It was essential that tensile strength and elongation would be retained after oven aging, since the bladder is subjected to heat and alternate increase and release of pressure. Two compounds proved satisfactory, one based on Hycar 1042, the other based on Hycar 1002.

**A compound that maintained properties upon immersion in fuel** was requested for a gasket application. A compound based on Hycar 1041 and 1042 showed a volume swell of only 1%, and no change in hardness, after immersion for 60 days in Reference Fuel B, followed by 30 days drying.

**LIQUID GR-S POLYMER LOWERS VISCOSITY OF STANDARD GR-S.** Ten to fifteen parts of Hycar 2000X68, a liquid GR-S polymer now in production, can be substituted for an equivalent amount of standard GR-S to lower the Mooney viscosity of the mixture to that of GR-S 1010. Since the latter is premium priced and difficult to manufacture, the liquid polymer should be useful and economical in many applications.

Another use where the liquid polymer can prove valuable is in substituting for part of the Hycar in recipes to improve processing characteristics, in compounds where high hardness is desired in the cured state.

For further information on Hycar nitrile rubber, write Dept. EP-1, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ont.

**Hycar**
*American Rubber*

**B.F.Goodrich Chemical Company**
**a division of The B.F.Goodrich Company**

**B.F.Goodrich** GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

# Every two hours during production PHILBLACK* must pass rigorous screen tests!

The Philblacks are noted for their freedom from grit. Water wash tests, over an 80 mesh screen, are designed to maintain Philblack's high standards of quality. Representative samples, chosen at random from the regular production of the Philblacks, are checked and rechecked by still other evaluation tests.

Samples of cured rubber containing Philblack are tested for ability to stand stress and strain at various temperatures. Angle abrasion loss is determined accurately by weight. And Philblack compounds are further tested for compression set, crescent tear, flex life, heat buildup and other properties important to the rubber industry.

Philblack's constant quality controls and rigid testing procedures assure you of exceptionally high quality, uniform carbon blacks. You can *depend* on the Philblacks. Write your Philblack representative for full information.

*A trademark

## *Meet the Philblacks!* DISCOVER WHAT THEY'LL DO FOR YOU!

**A** **Philblack A FEF Fast Extrusion Furnace Black**
Ideal for smooth tubing, accurate molding, satiny finish. Mixes easily. High, hot tensile. Disperses heat. Non-staining.

**O** **Philblack O HAF High Abrasion Furnace Black**
For long, durable life. Good electrical conductivity. Excellent flex. Fine dispersion.

**I** **Philblack I ISAF Intermediate Super Abrasion Furnace Black**
Superior abrasion resistance at moderate cost. Very high resistance to cuts and cracks. More tread miles at high speeds.

**E** **Philblack E SAF Super Abrasion Furnace Black**
Toughest black on the market. Extreme abrasion resistance. Withstands aging, cracking, cutting and chipping.

Phillips 66

**PHILLIPS CHEMICAL COMPANY,** Rubber Chemicals Division, 318 Water St., Akron 8, Ohio. Export Sales: 80 Broadway, New York 5, N. Y.
West Coast: Harwick Standard Chemical Company, Los Angeles, California.

# Now—A "living textbook" for the rubber industry!

Pictured above is the beginning of a new service to you from Goodyear, the leading supplier of light-colored synthetic rubbers. It's a *Tech Book for the Rubber Industry* – a compilation of technical information on raw materials manufactured by the Chemical Division for use in rubber products.

In the Tech Book, you'll find answers to such questions as: What are the physical properties of PLIOFLEX 1006? Which of the PLIOFLEX rubbers are oil-extended? How does the new CHEMIGUM N-6B differ from its sister nitrile rubbers? How do you compound CHEMIGUM N-7 to meet Specifications AMS 7274C? And you'll also find similar information on PLIOLITE S-6B – the rubber reinforcing resin – and WING-STAY S – a nonstaining antioxidant.

What's more the Tech Book, as it now stands, *is just the beginning.* It's in a convenient, loose-leaf form so that it can be kept alive and up-to-date with periodic bulletins. Write today, on company letterhead, for your *free* Tech Book and the start of the complete story on PLIOFLEX, CHEMIGUM and related products. The address: Goodyear, Chemical Division, Akron 16, Ohio.

CHEMICAL
GOODYEAR
DIVISION

RUBBER & RUBBER CHEMICALS DEPARTMENT

Chemigum, Plioflex, Pliolite, Plio-Tuf, Pliovic, Wing-Stay – T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

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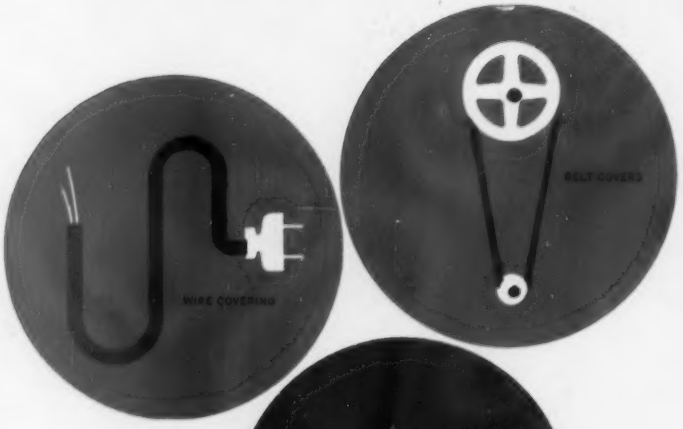
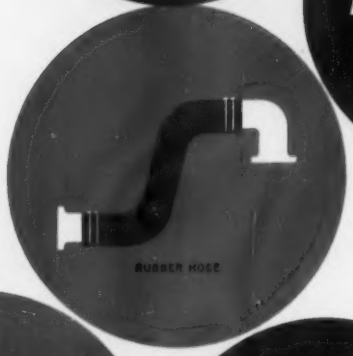
High Polymer Resins, Rubbers, Latices and Related Chemicals for the Process Industries




***There's a Huber Oil Black for Every Need!***

**AROMEX ISAF**

**AROMEX HAF**

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COVERING THE MANUFACTURE OF RUBBER AND RUBBERLIKE PLASTICS PRODUCTS


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Microfilm copies of complete volumes of RUBBER AGE are available from: University Microfilms, 313 North First St., Ann Arbor, Mich.
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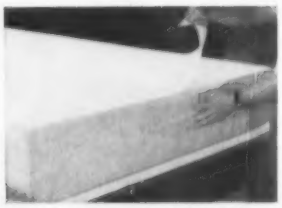
# New Patapar®

## *Releasing Parchments*



*As a casting sheet for polyurethane foams, Patapar gives a smooth satin finish.*

*Patapar releases easily from pressure sensitive plastics.*

*As a separator for rubber tape, Patapar provides just the right release action.*

**peel off easily from pressure sensitive and tacky surfaces**

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- Polyesters
- Vinyls
- Organic adhesives
- Organosols
- Phenolics
- Acrylics

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**Patapar®**
**RELEASING PARCHMENT**

**HEADQUARTERS FOR VEGETABLE PARCHMENT SINCE 1885**


# Letters to the editor

## Natural on Way Out?

Dear Sir:

It sometimes occurs to me that our Washington officials and a good part of the rubber industry may be beating a dead horse on this question of the natural rubber stockpile. Surely, the defense of this country calls for adequate strategic stockpiles of all kinds. Where rubber is concerned, however, a different set of circumstances may prevail.

Firstly, what happens to the natural rubber stockpile if these "natural-synthetic" rubbers prove adequate to our needs? If we dump the stockpile we destroy the economies of all the countries in Southeast Asia. If we keep the stockpile and use it to the best advantage, we are still faced with a problem of economics and technological suitability.

We seem to have worked ourselves into some kind of a blind alley where natural rubber is concerned. On one hand, we are trying to keep an industry alive. (Surely a natural rubber plantation is not the best investment these days). On the other hand, we may be stuck with large quantities of a material we can do without.

For these reasons, some new kind of thinking is in order on this entire subject. Maybe a planned disposal of natural rubber stocks is in order—one that will permit a reduction in stocks and still not damage Far Eastern economies.

Although I am not a military strategist I also wonder about this wohle concept of very large stockpiles of anything. In an atomic war, we may not find ourselves with any use for the stockpiled materials if, indeed, there are any of us left at all.

I would like to see this entire question discussed candidly and I would be interested in knowing your readers' sentiments.

TAXPAYER

San Francisco, Calif.

## Needed: Non-Slip Boots

Dear Sir:

We would appreciate knowing of any manufacturers or sellers of ladies' rubber boots of a type designed to prevent falling or slipping while walking over an icy pavement.

We are told there is a ladies' rubber boot with a built-in adjustable buckle designed to act as an ice creeper.

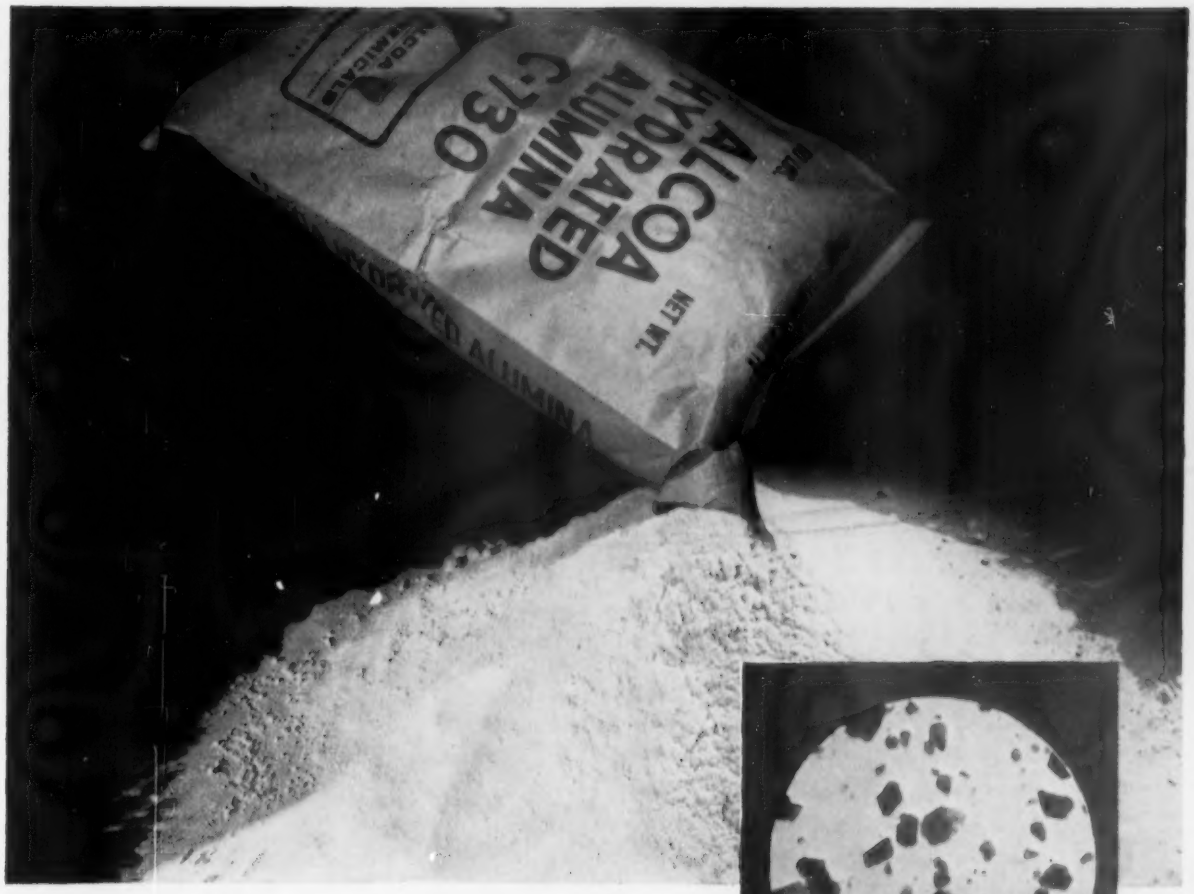
A handicapped young lady is in need of a pair of rubber boots that would enable her to safely walk over an icy pavement.

We would appreciate any advice and would appreciate knowing of other sources of information.

Thank you.

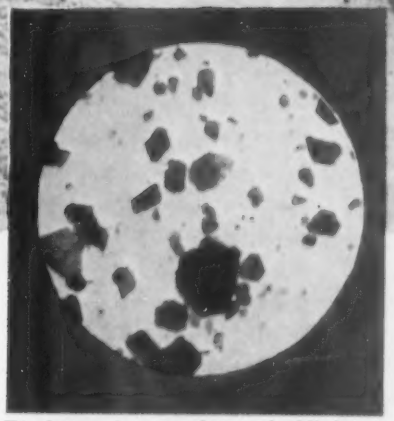
S. STARK

3208 Gladstone
Detroit 6, Mich.




# Spotlight on a good mixer...

## ALCOA HYDRATED ALUMINAS SERIES C-700



This electron microscope photograph of Hydrated Alumina C-730 (magnification 25,000X) shows fineness of particles. Average number diameter is 0.06.

Fine particle size, uniformity, good mixing characteristics and substantial chemical neutrality make ALCOA Hydrated Aluminas Series C-700 outstanding general-purpose pigments. As fillers, coatings, reinforcing pigments and even mild abrasives, they improve the quality of such varied products as natural and synthetic rubbers, plastics, fine coated papers, cosmetics, paints and varnishes, adhesive tapes, cleaners and polishers.

Used as reinforcing pigments in natural and synthetic rubber, Hydrated Aluminas Series C-700 impart high tensile strength, tear resistance and modulus along with good resiliency. They mix easily and rapidly with rubber compounds—with relatively little sticking to the mixing equipment. Their dispersion is excellent.

As a paper coating pigment, Hydrated Alumina C-730 gives a coating of great brightness, opacity and gloss with a high degree of whiteness. Ink receptivity is high for the degree of gloss obtainable.

Equally desirable physical characteristics are obtained when Hydrated Aluminas Series C-700 are used as a filler in plastics, particularly vinyls . . . as pigments in casein paints . . . as a relatively soft, extremely fine abrasive in special polishing applications . . . or as a very fine, soft filler or base for cosmetic powders.

If *you* have need of an outstanding general-purpose pigment for *your* products, it will pay you to investigate ALCOA Hydrated Aluminas Series C-700. You'll find their contributions to better products often cost less than pigments you now use. Get complete information by writing ALUMINUM COMPANY OF AMERICA, 713-A Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA CHEMICALS
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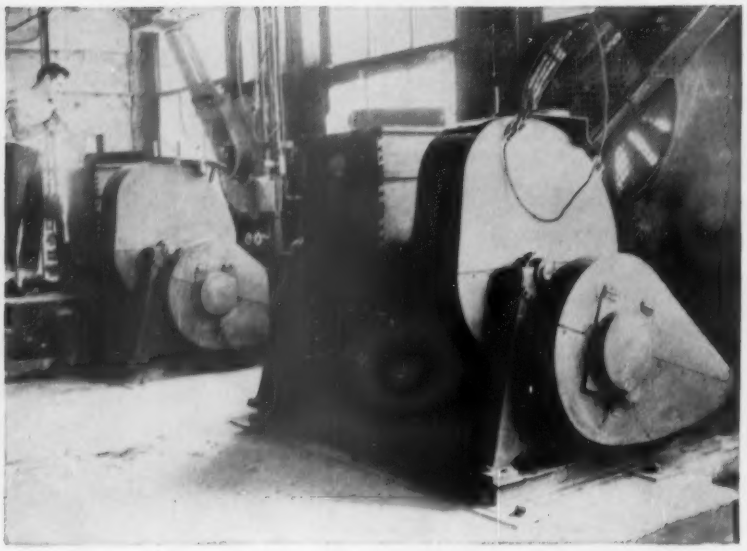
THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS



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**#1** *It's faster* . . . delivers more production per hour.

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**MEXICO:** T. de la Pena e Hijos, S.A., Nazas 45-A, Mexico 5-D.F.

## Last Word?

Dear Sir:

These arguments which have been going on in your columns the past few months on this business of the competency of tubeless tires has me a little confused. Personally I have used tubeless tires since their introduction and I find them no better or no worse than their tubed predecessors.

I sometimes wonder why we should expect so much. After all, the kind of cars which are being built today are notoriously inefficient. Come to think of it, my last set of tubeless tires outlasted my car!

A point to remember is this. Tubeless tires depend on factors above and beyond the tire manufacturers' control—clean rims for example. As long as manufacturers make good on the lemons and as long as improvements continue to be made we can look forward to happier days.

ALFRED HENSHAW

Boston, Mass.

## Change of Name

Dear Sir:

The Latymer Engineering Company has sent us your letter of December 17 enclosing the tear sheet from your December issue.

Since the editorial information was sent to you on which the article was based this company has purchased the rights of manufacture of Latymer vacuum forming machines and they will in future be known as Daniels/Latymer.

We should be grateful if you could insert a paragraph to this effect and refer any inquiries to us should they be received through you.

M. G. BURGES-SHORT

T. H. & J. Daniels, Ltd.
Stroud, Glos., England

## We Stand Corrected

Dear Sir:

The November, 1956, issue of RUBBER AGE carried an article entitled "Cone Drive Handles 18,000 Pounds of Belting". This article referred to a new operation at Quaker; however, the name was incorrectly stated as Quaker Rubber Corporation.

Please be advised that the correct name is Quaker Rubber Division, H. K. Porter Company. In the future, will you please see that the name is listed correctly.

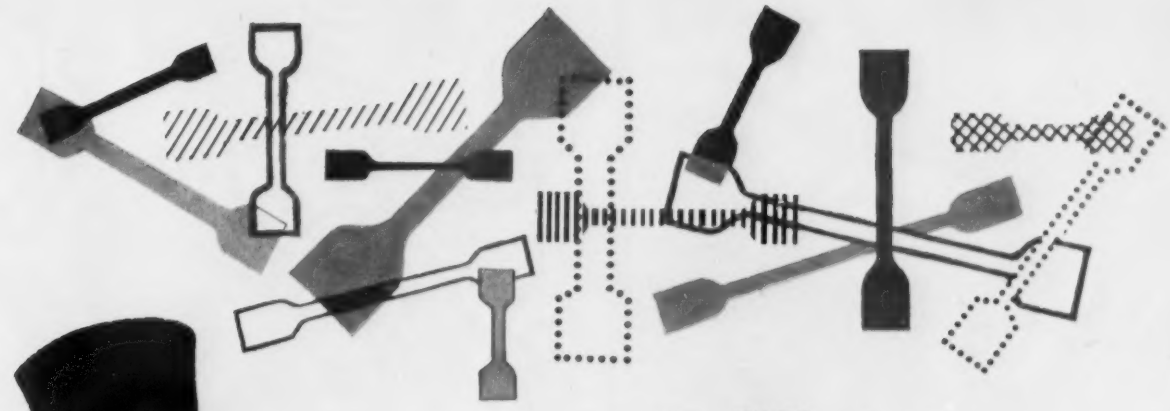
Thank you.

R. F. KANE

Quaker Rubber Division,
H. K. Porter Co., Inc.,
Philadelphia 24, Penna.

*Memo from the Editor*

**The "Letters to the Editor" columns are open to all of our readers and we invite comments for publication. These comments may be specifically applied to published articles and news items or may reflect views on any facet of the rubber industry. We reserve the right to edit all material. Address: Editor, RUBBER AGE, 101 West 31st St., New York 1, N. Y.**



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## rubbers to fit your special requirements!

That's right! There are 16 non-pigmented and pigmented Philprene polymers to choose from! That means you can select a Philprene that's tailor-made for your purpose . . . one which will give you the physical characteristics and processing qualities you need in your product and is best suited to your manufacturing facilities.

And to help you select that Philprene, Phillips maintains a practical, technical advisory service. Call our technical representative for a consultation on your problems. We are glad to assist you in the efficient and profitable use of Philprene. What is good business for you is good business for us, too, so don't hesitate to let us know how we can be helpful.

Phillips 66

| CURRENT PHILPRENE RUBBERS | | |
|---|---|---|
| | NON-PIGMENTED POLYMERS | PIGMENTED WITH PHILBLACK* |
| HOT | PHILPRENE 1000<br>PHILPRENE 1001<br>PHILPRENE 1006<br>PHILPRENE 1009<br>PHILPRENE 1018<br>PHILPRENE 1019 | |
| COLD | PHILPRENE 1500<br>PHILPRENE 1502<br>PHILPRENE 1503 | PHILPRENE 1601<br>PHILPRENE 1605 |
| COLD OIL | PHILPRENE 1703<br>PHILPRENE 1706<br>PHILPRENE 1708<br>PHILPRENE 1712 | PHILPRENE 1803 |

**PHILLIPS CHEMICAL COMPANY**
**Rubber Chemicals Division**
**318 Water Street, Akron 8, Ohio**

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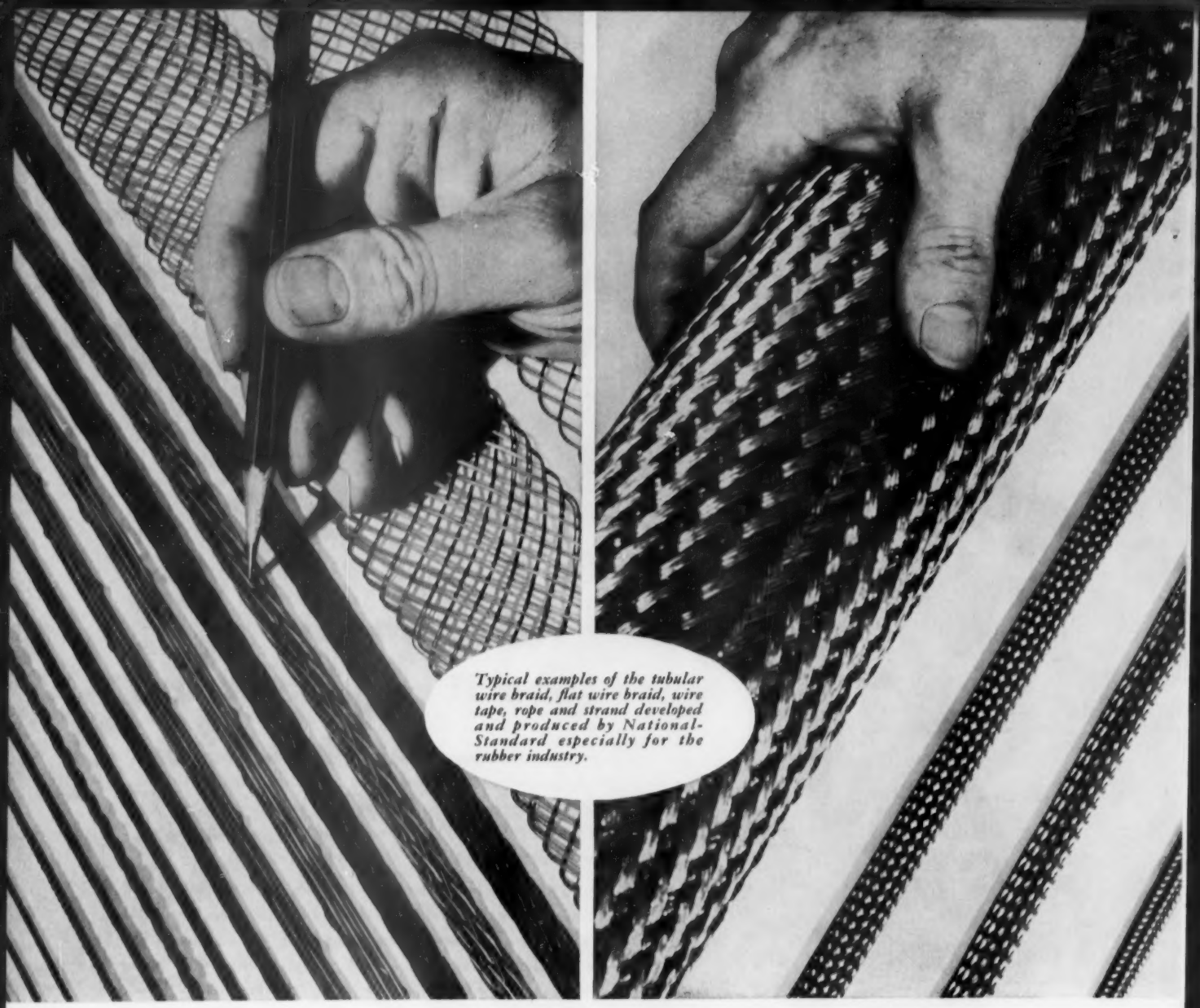

*Typical examples of the tubular wire braid, flat wire braid, wire tape, rope and strand developed and produced by National-Standard especially for the rubber industry.*

## Wherever wire and rubber work together...

• For half a century, National-Standard has dedicated large scale research and engineering to improving the teamwork of wire and rubber. It is still going on . . . extensive work on wire fabrication, finish, corrosion, strength, elongation, adhesion and other factors that can affect the behavior and cost of your wire-in-rubber products.

So, wherever wire and rubber must work together, it is more than likely that National-Standard can contribute—particularly where new production or new service requirements are involved. We want to be of help . . . and are geared to do it well, without obligation. Check with us now . . . or anytime!

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**for bonding Natural Rubber and GR-S Compounds**

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Two-coat Adhesive System for bonding of Butyl Rubbers.

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the single coat Adhesive for bonding Natural and GR-S compounds.

**TY-PLY "BN"**
for bonding N-types

**TY-PLY "S"**
for bonding Neoprene

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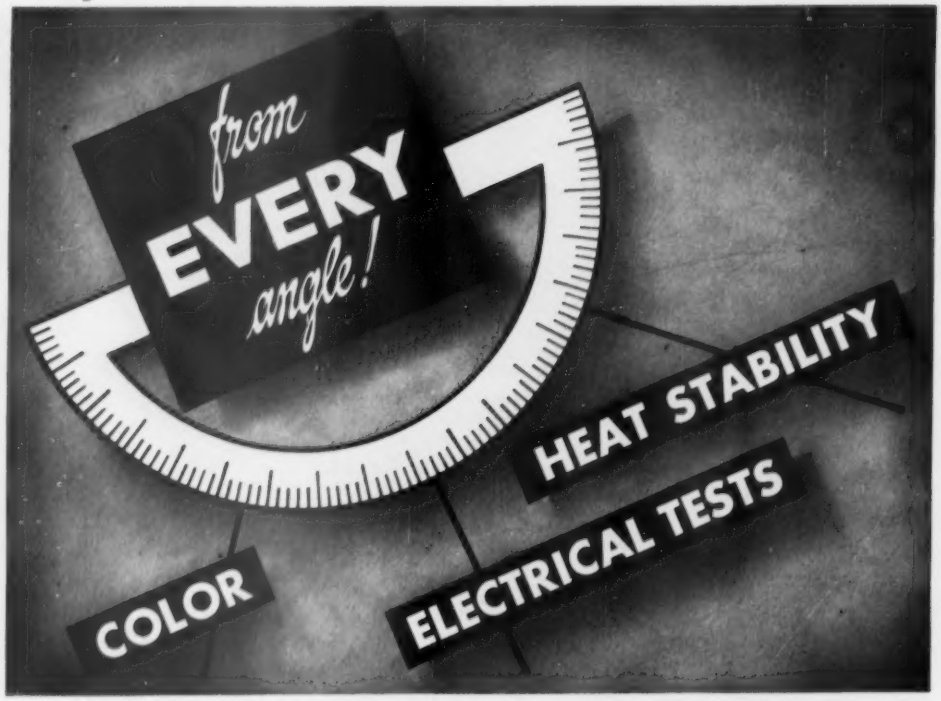
Division of BORG-WARNER
GARY, INDIANA

***TY-PLY has stood the test of time . . . since '39***




# PIGMENT NO. 33

*for Compounding*

**VINYLS AND SYNTHETIC RUBBER**

**Sample and technical data sent promptly on request**

## SOUTHERN CLAYS, Inc.

33 RECTOR STREET
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# new!

# CHEMLOK 220 AND 201 ADHESIVES

## for bonding uncured elastomers to metals

**CHEMLOK 220** remarkable one-coat adhesive out-performs conventional two-coat adhesive systems.

**CHEMLOK 201** used as primer with CHEMLOK 220—gives exceptional environmental resistance.

***versatile.....***

**One coat OF CHEMLOK 220 BONDS**

- Natural Rubber
- Neoprene
- GR-S
- Butyl
- Buna N

**TO**

- Carbon or alloy steels
- Stainless steel
- Copper or copper alloys
- Brass
- Aluminum or aluminum alloys
- Magnesium
- Die casting alloys
- Plated metals
- Rigid plastics

**ONE-COAT APPLICATION**—A single coat of CHEMLOK 220 is sufficient for most bonding applications. Bond strength normally exceeds that obtained with conventional two-coat adhesives.

**SIMPLIFIED MANUFACTURING**—Adequate bonds are possible under a wider range of manufacturing conditions than ever before—metal surface preparation is minimized. Adhesive inventory may be considerably reduced.

**ECONOMY**—One-coat application means less adhesive is used, less labor, less processing time. Exceptional bond strength means less scrap loss, better service life. Easy processing saves manufacturing cost.

**ENVIRONMENTAL RESISTANCE**—Superior resistance of the bond to heat, hot and cold water, salt spray, chemicals, electro-plating solutions, solvents and corrosive atmospheres is obtained with CHEMLOK 201 as primer with CHEMLOK 220.

*For detailed information on CHEMLOK 220 and 201, mail coupon or write for evaluation samples.*

CHEMLOK ADHESIVES

**SPECIAL PRODUCTS DIVISION**
**LORD MANUFACTURING COMPANY**
**Erie, Pennsylvania**

**Lord Manufacturing Company**
**Special Products Div., Erie, Pa.**

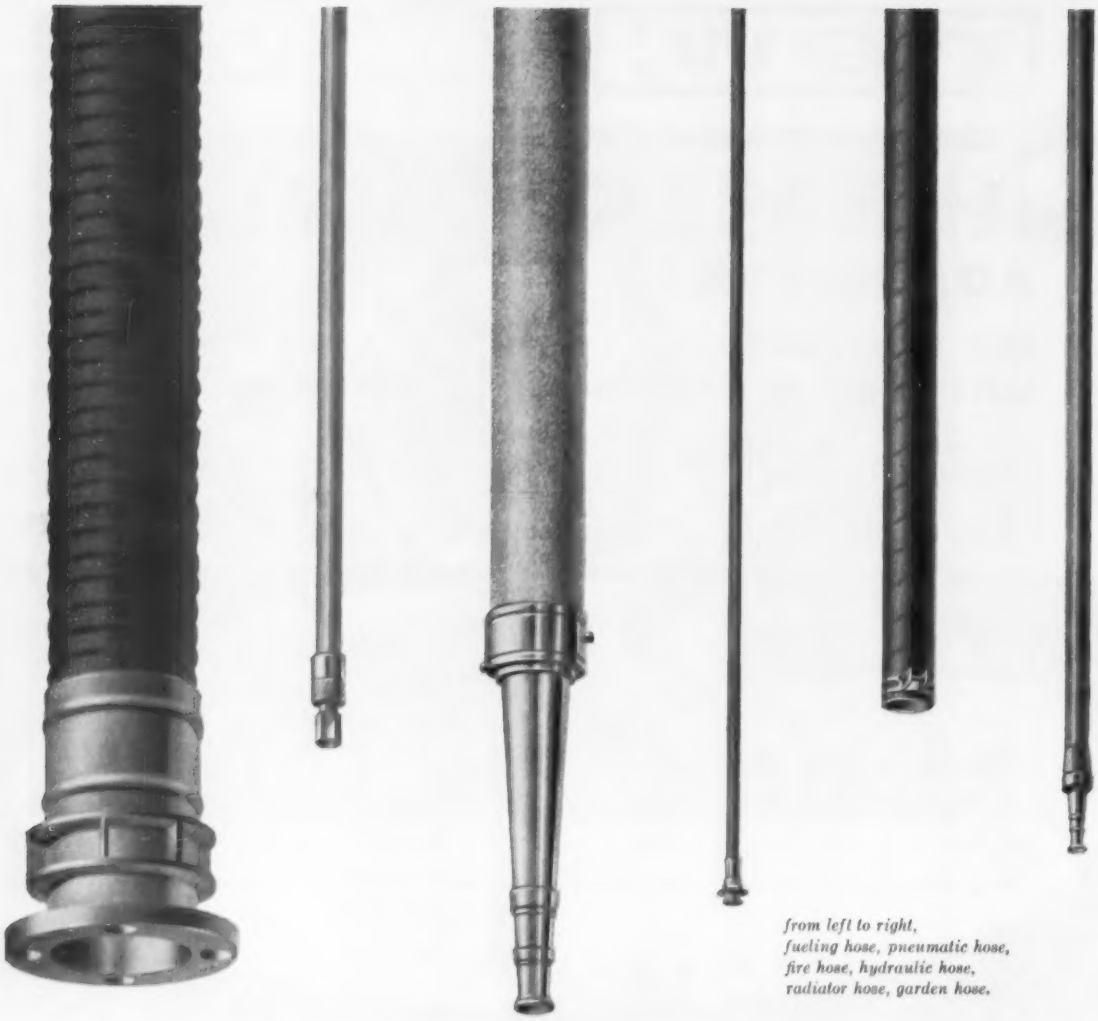
Please send me product data on CHEMLOK 220 and 201.

Name_____ Title_____

Company_____

Address_____

City_____ State_____



*from left to right,*
*fueling hose, pneumatic hose,*
*fire hose, hydraulic hose,*
*radiator hose, garden hose.*

# Amazingly light, stronger than steel Fortisan-36 takes the woes out of hose

We can spin Fortisan-36 rayon finer than a strand of hair. Yet pound for pound it is stronger than steel. Within a year this remarkable new Celanese rayon fiber has proven itself in almost every type of hose.

When the pressure is on, Fortisan-36 delivers more strength for less weight. It means greater flexibility. Handling ease. Heat resistance. Safety.

Not hoses alone, but heavy-duty applications from V-belts to tarpaulins have made rewarding use of Fortisan-36 virtues: its exceptional dimensional stability, low elongation, extreme tensile strength.

With Fortisan-36 as with all Celanese great industrial fibers, we deliver not only the fiber but our skills as well—from fabric development in our plants to technical assistance in yours.

Celanese Corporation of America, Industrial Sales Dept., Charlotte, North Carolina. Branch offices: 180 Madison Ave., New York 16; 22 W. Madison St., Chicago 2. For export: Pan Amcel Co., Inc. and Amcel Co., Inc., 180 Madison Ave., New York 16.

Celanese®

**Celanese Fibers for Industry**

**FORTISAN® RAYON • FORTISAN®-36 RAYON • ARNEL® TRIACETATE • ACETATE • VISCOSE-RAYON**

In these five Standard Units are all the necessary components to control effectively the degradation mechanisms that take place in polyvinyl chloride resins on aging, during heat processing or on exposure to sunlight. They are widely used alone and in combinations for specific effects in clear and opaque stocks. Their advantages have been proven over other tested materials, such as those based on tin (which frequently decolorizes effects of degradation without correcting them) or on lead (which frequently contributes to oxidation and breakdown on aging). We also supply combinations of components selected from these five Standard Units, to correct special conditions encountered in each Vinyl Processing Industry.

**Write for information about stabilizers designed for versatile and inexpensive use in formulations employed in your particular vinyl processing industry.**

*Is it for—*

**Quality Vinyl Flooring?**
**Non-Plating Calendered Stocks?**
**Maximum Clear Sheets?**
**Non-Sulfur Staining Films?**
**Low Cost Clear & Opaque Hose?**
**Top Physical Properties in Rigids?**
**Air-Releasing Plastisols?**
**Controlled Slush Molding?**

*This Stabilizer System is for*

**CLEAR SHEETS**
**Cd 2-V-4**
**Org 8-V-1**

**The HARSHAW CHEMICAL Co.**

**1945 E. 97th STREET • CLEVELAND 6, OHIO**

# POLYMEL C-130

*A solid, friable terpene-copolymer resin effective in highly-loaded GR-S and natural rubber stocks*

PLASTICIZES

INCREASES FLEX-CRACK GROWTH RESISTANCE

INCREASES SHORE HARDNESS

MAINTAINS ABRASION RESISTANCE

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MANUFACTURERS OF
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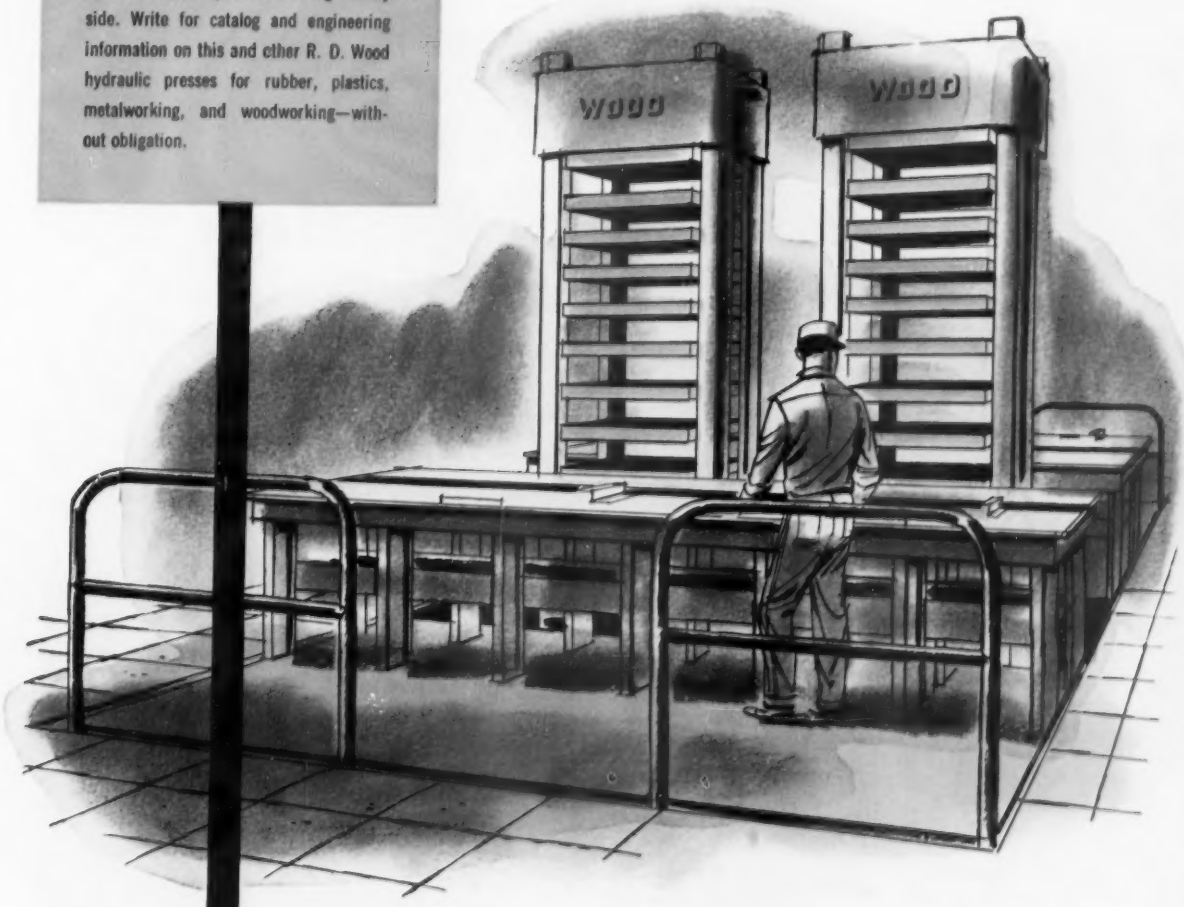
192-ton Multiple Opening Platen Press. Designed for molding rubber products. This press may be operated from an individual self-contained pumping unit or a central accumulator system. Two elevators operate with two presses working side by side. Write for catalog and engineering information on this and other R. D. Wood hydraulic presses for rubber, plastics, metalworking, and woodworking—without obligation.

## *The nameplate is your guarantee of value*

When you buy an R. D. Wood press, you can take *full value* for granted. In more than 150 years, the R. D. Wood nameplate has never appeared on a product of inferior quality. It is your guarantee of sound design, premium materials, superlative craftsmanship. It is your assurance also of smooth, trouble-free performance, high productivity, long life and production economies.

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PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

*Representatives in Principal Cities*

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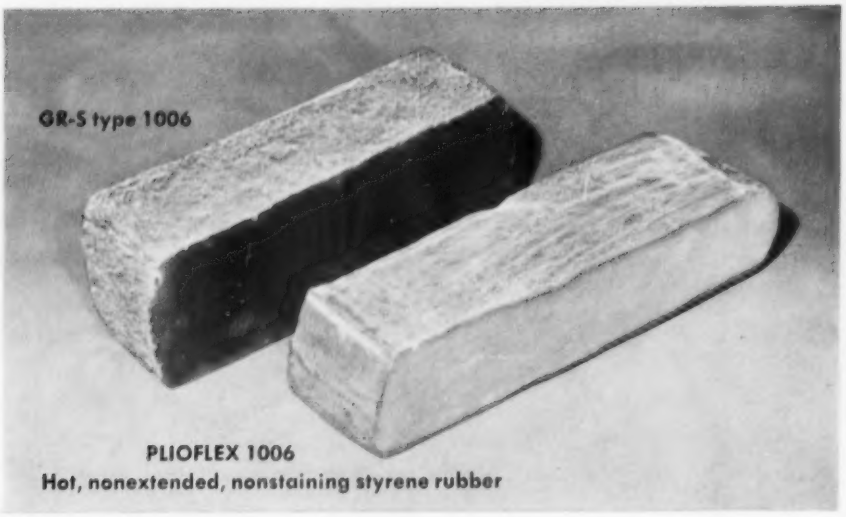
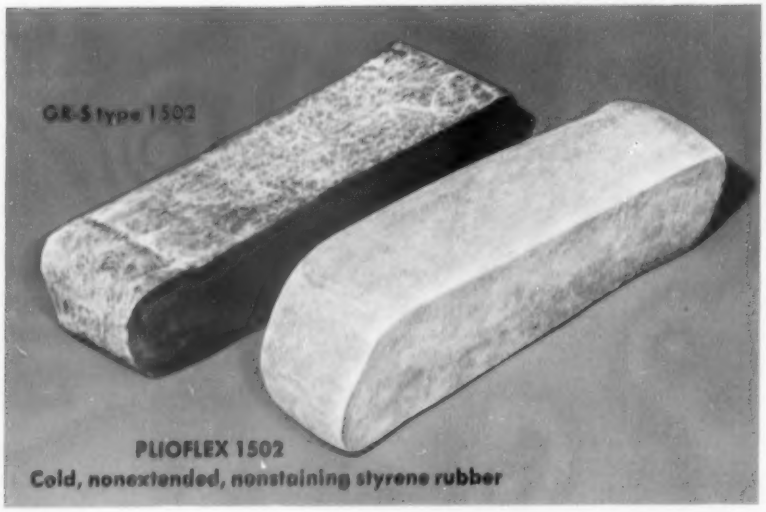
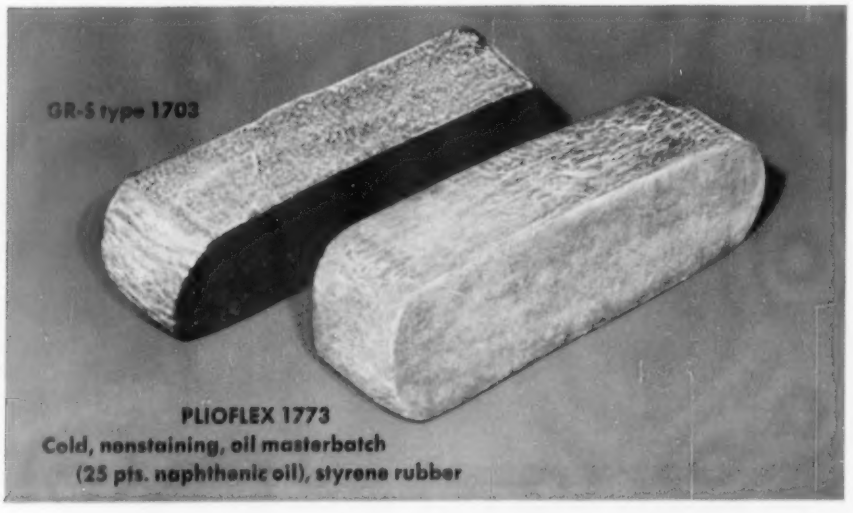


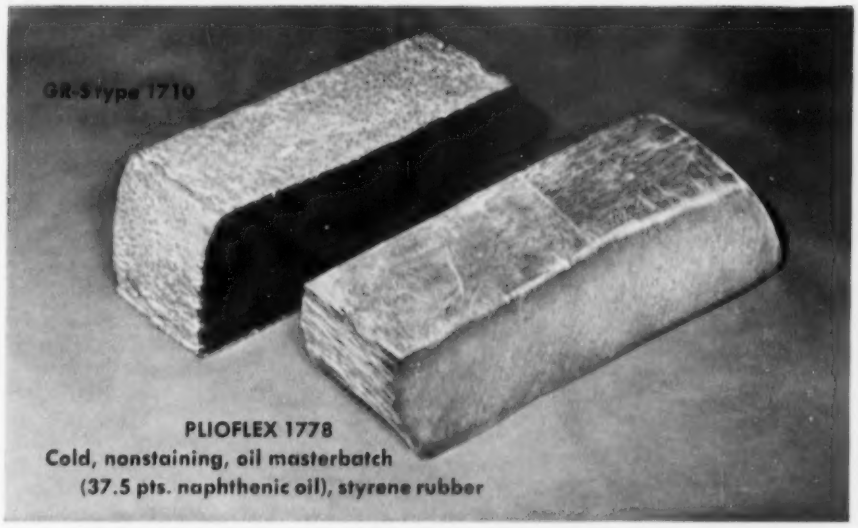




# How many




CHEMIGUM • PLIOFLEX • PLIOLITE •

High Polymer Resins, Rubbers, Latices and




# new products here for you?

Pictured on these pages are unretouched photographs of various styrene-butadiene rubbers, those formerly designated as GR-S in contrast with corresponding PLIOFLEX rubbers now produced by Goodyear. They quickly tell the story of improvements made in both raw materials and manufacturing techniques to bring you the best, most complete line of nonstaining, non-discoloring rubbers ever to be offered.

But these pictures should do more than tell of past accomplishments. What about the present and the future? What thoughts do they bring to your mind about improving present products with PLIOFLEX? How many totally new products do they start you thinking about?

Probably the most significant feature of the new PLIOFLEX line lies in its ability to meet fully the demands of color-conscious consumers and to do it over a wide range of physical properties and cost. This is particularly true since the new light color of PLIOFLEX, in both nonextended and oil-extended types, combines excellent physical properties and processing characteristics at minimum cost.

In other words, with PLIOFLEX you can now compete for markets demanding critical color specifications—markets never before open to synthetic rubber.

Learn more about the new, light color of PLIOFLEX, and discover how it can help you to new or improved products. Why not write, right now, for the full story, including the latest *Tech Book Bulletins*, to: Goodyear, Chemical Division, Akron 16, Ohio.

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T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

*improves* **ELONGATION**

*gives lower modulus and better cut-growth resistance*

# PARA RESIN 2457

Para Resin 2457 is a dark-colored petroleum base resin. Its softening point, between 200-220° F, lends itself to good dispersion. It improves the flow of extrusion stocks and gives smooth calendered stocks. Because of its low specific gravity and volume cost, it is an economical compounding ingredient for mechanical goods. Tests against other resins have proven Para Resin 2457 to be far superior in every way. More and more manufacturers of mechanical goods are turning to Para Resin 2457 for improvement in product quality at lowered unit cost. Try it in your products.

*Testing a free sample may save you many, many dollars. You owe it to your products to give it a trial.*

The C. P. Hall Co.
CHEMICAL MANUFACTURERS

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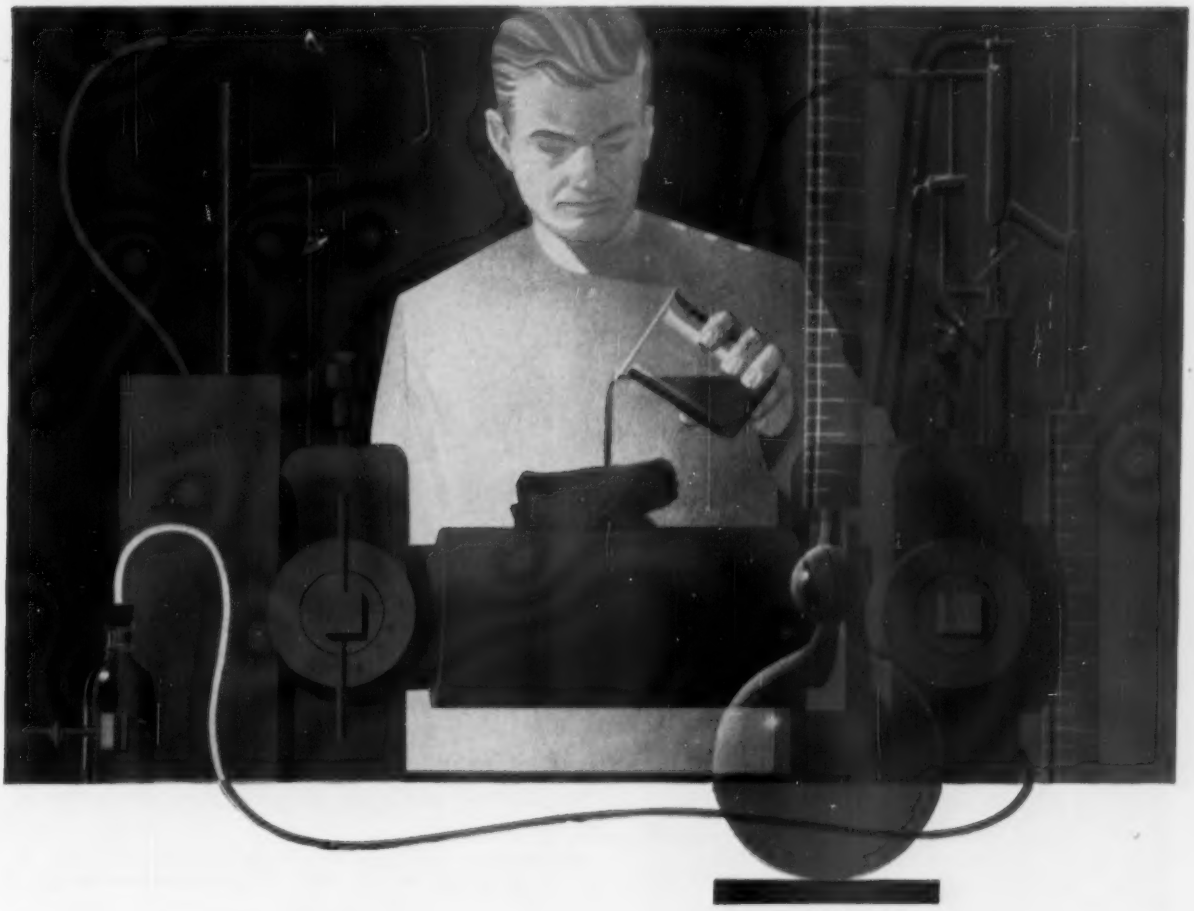

## Our Technical Service Laboratory Will Help You Build Better Products With Neville Resins

If you are not already using Neville coumarone-indene resins in the manufacture of your rubber products, it will pay you to request the assistance of our Technical Service Laboratory. Our chemists will work with yours in choosing the exact grade to suit your need. Neville coumarone-indene resins are ideal extender-plasticizers. They aid processing and add tensile strength and durability to finished compounds. Write for details.

**Neville Chemical Company, Pittsburgh 25, Pa.**

**Resins**—Coumarone-Indene, Heat Reactive, Phenol Modified Coumarone-Indene, Petroleum, Alkylated Phenol • **Oils**—Shingle Stain, Neutral, Plasticizing, Rubber Reclaiming • **Solvents**—2-50 W Hi-Flash, Wire Enamel Thinners.

NEVILLE

Please send information on Neville Chemicals.

NAME TITLE

COMPANY

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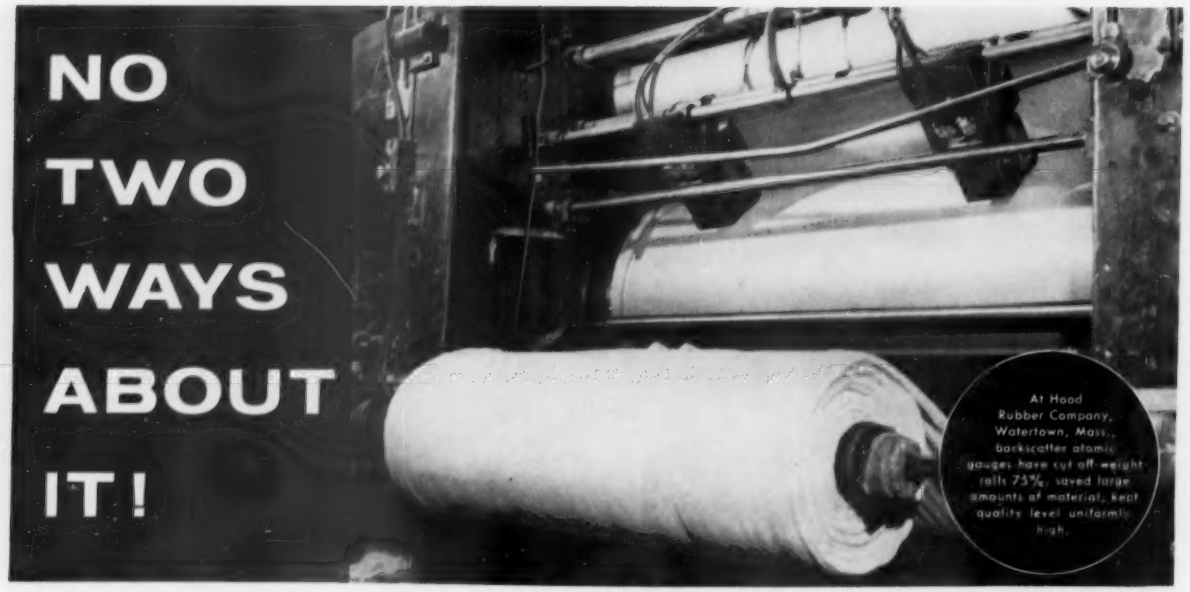
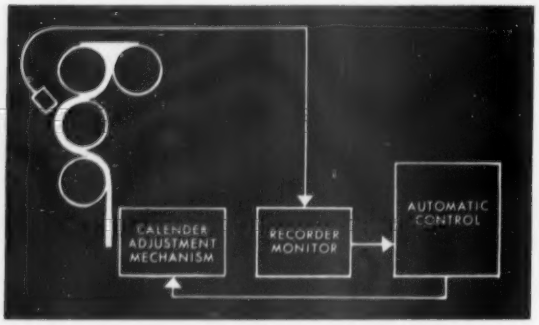
CITY NC-11-RA STATE

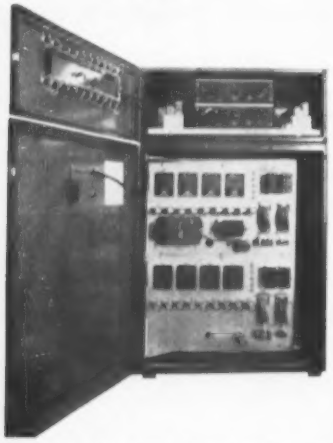
# NO TWO WAYS ABOUT IT!


At Hood Rubber Company, Watertown, Mass., backscatter atomic gauges have cut off-weight rolls 75%, saved large amounts of material, kept quality level uniformly high.

## *Experience proves that there is a superior way to control thickness in coating, impregnating, laminating or calendering rubber sheet.*




*Backscatter gauges located at the calender rolls "sense" rubber thickness, report it to the automatic control system which then adjusts the rolls to the precise setting to keep material exactly "on gauge" from edge to edge of the sheet.*



*Tracerlab's new dual channel automatic control offers precise, automatic continuous control of thickness . . . eliminates shut-down for manual gauging . . . "closes the loop" and puts automation to work for you.*

Only Tracerlab's Beta Gauges using back scatter radiation offer all these advantages for cutting costs and improving quality!

**INSTANTANEOUS DETECTION** of thickness variation. Gauges can be located close to nip and can "read" changes immediately, minimizing "off spec" production.

**MANUAL OR COMPLETELY AUTOMATIC OPERATION.** Adding Tracerlab's automatic control console "closes the loop" and makes your operation completely automatic.

**CUSTOM INSTALLATION** to fit your particular needs from standardized components offers economy.

**RUGGED INDUSTRIAL CONSTRUCTION** enables this gauge to withstand rough conditions. Easily accessible and standardized parts make it easy to service.

**FASTER START-UP TIME.** Some users report change-over from one job to the next has been reduced to one-third of time previously taken.

**EASY TO OPERATE.** The equipment can be used by production line employees.

Tracerlab originated and perfected the back scatter principle for its Beta Gauges over seven years ago. These gauges were developed by our engineers to meet the need for a gauge where source and detector are one unit making it ideal for use where mounting space is limited or for coating applications where the thickness of a coating as it passes over a calender is to be determined.

If your plant is not getting the benefits of this modern control system, write today for further information.

*Get this informative data book on how Tracerlab Beta Gauges with automatic control can make savings for you.*

Tracerlab KELEKET **Tracerlab**

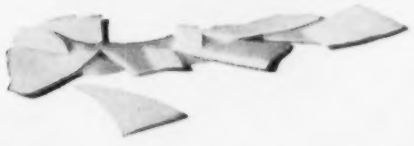
130 High Street, Boston 10, Mass.
2030 Wright Avenue, Richmond 3, Calif.

OFFICES IN PRINCIPAL CITIES
THROUGHOUT THE WORLD

# Here's news!

# Baker CALCIUM NITRATE, Tech.
# ZINC NITRATE, Tech.

## in THIN FLAT FLAKES



- *Faster dissolving*
- *Uniform purity—lot after lot*
- *Controlled water of hydration*
- *Easier to handle*

Look over the photograph above, reproduced to actual size. Note the thin flakes with large surface area. THIN FLAKES go into solution FAST – you save time and money. They are easy to handle. These chemicals in *flake* form represent another Baker first.

Latex processors gain better control of coagulation because of the controlled high assay and known water of hydration. This uniform purity, controlled pH and freedom from extraneous matter insure better quality in your finished goods with fewer rejects.

These chemicals are produced to meet precise specifications. In the informative typical analysis shown below, note the very low ammonium nitrate content in Baker Calcium Nitrate. The exceptionally low copper and manganese contribute to longer life for your latex products, with less tendency to oxidize and become brittle or too soft.

These features of Baker Calcium Nitrate and Zinc Nitrate also are helpful to manufacturers of rustproofing specialties, textile finishes, pigments, adhesives and lithographic materials.

Because of the low melting points and deliquescent nature of these chemicals, they are packaged with polyethylene liners and are stored in an air conditioned warehouse at a temperature below 85°F.

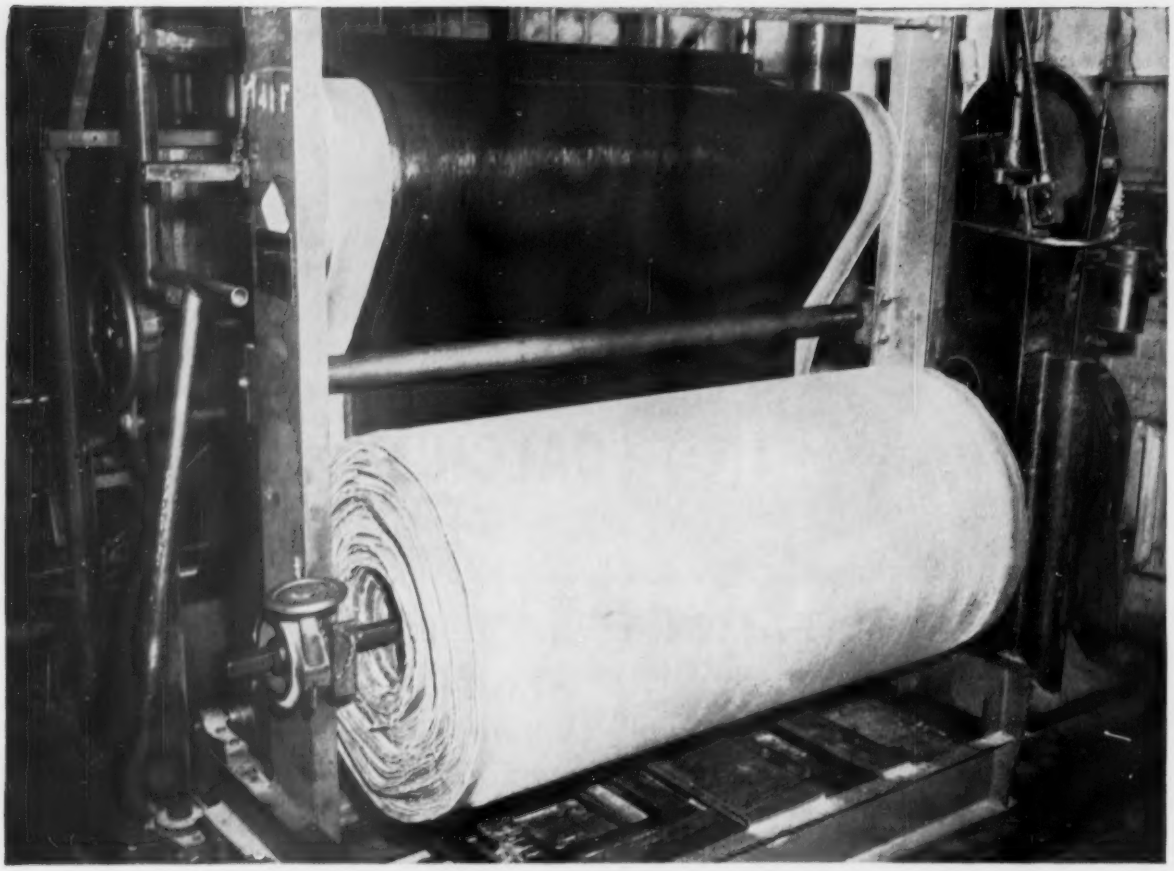
Write for samples and prices for these new *flaked* products, Calcium and Zinc Nitrate Technical.

| **CALCIUM NITRATE,** Technical Flake | *Typical analysis* |
|---|---|
| Assay (as $Ca(NO_3)_2$) | 71.8 % |
| Water of Hydration | 27.6 % |
| Insoluble and $NH_4OH$ Ppt. | 0.03 % |
| Ammonium Nitrate ($NH_4NO_3$) | 0.1 % |
| Magnesium & Alkalies (as $NO_3$) | 0.4 % |
| Iron (Fe) | 0.0003% |
| Copper (Cu) | 0.0004% |
| Manganese (Mn) | 0.001 % |
| pH of 5% Solution | 6.3 |
| Thin (0.025 in.) flakes about ½ inch in size with the following typical mesh analysis: | |
| On U.S. No. 4 | 45% |
| Thru U.S. No. 20 | 8% |

| **ZINC NITRATE,** Technical Flake | *Typical analysis* |
|---|---|
| Assay (as $Zn(NO_3)_2$) | 74.2 % |
| Water of Hydration | 25.6 % |
| Insoluble Matter | 0.008 % |
| Iron (Fe) | 0.001 % |
| Lead (Pb) | 0.005 % |
| pH of 5% Solution | 5.1 |
| Thin (0.035 in.) flakes about ½ inch in size with the following typical mesh analysis: | |
| On U.S. No. 4 | 26% |
| Thru U.S. No. 20 | 9% |

**PURITY BY THE TON**
*–for production use*

**J. T. Baker Chemical Co.**
REAGENT • CHEMICALS • FINE • INDUSTRIAL
**Phillipsburg, New Jersey.**



# CLIMCO PROCESSED LINERS

## Eliminate Adhesions at the Bias Cutter

If your stock has been stored in a Climco Processed Liner, you can depend on easier, faster production, and the stock always separates from the liner cleanly, easily.

And Climco Processed Liners preserve the tackiness of the stock; exclude mould, bloom and sunlight. Rejects and losses due to gauge distortion are sharply reduced.

To speed production and to lengthen liner life, Climco Processing has been accepted in the rubber industry for 31 years. For superior liners, try Climco Processed Liners.

**THE CLEVELAND LINER & MFG. CO.**
**5508 Maurice Ave. • Cleveland 27, Ohio**

**GET THE FULL STORY ON CLIMCO PROCESSING**

Illustrated booklet tells about Climco Liners and Linerette separating paper. Tells how to get better service from liners. Write for your copy now.

**LINERETTE INTERLEAVING PAPER**
Treatment Contains
**NO OIL OR WAX**
Samples on Request

# CLIMCO
## PROCESSED LINERS

*FOR FASTER, BETTER PRODUCTION AT LOWER COST*

# ...an expanding symbol of quality and service in synthetic rubber!

## Current Polymers

| Cold | Class |
|---|---|
| ASRC 1500 | Staining |
| ASRC 1502 | Non-Staining |
| ASRC 1503 | Non-Staining |
| **Cold Oil Masterbatch** | |
| ASRC 1703 | Non-Staining |
| ASRC 1708 | Non-Staining |
| **Hot** | |
| ASRC 1000 | Staining |
| ASRC 1001 | Slightly Staining |
| ASRC 1004 | Staining |
| ASRC 1006 | Non-Staining |
| ASRC 1018 | Non-Staining |
| ASRC 1019 | Non-Staining |

## AMERICAN SYNTHETIC RUBBER CORPORATION

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Cable: AMSYNRUB NEWYORK

# Mass building boom takes concrete shape with help of fabric!



Final spraying of concrete on pneumatic form

Inflate a balloon —cover it with wire mesh —spray with concrete—deflate the balloon and another building is complete. Time: 24 hours! That is the procedure currently being used to build low-cost permanent structures—for storage buildings, hangars, schools, homes and other enclosures—in many parts of the world. The huge pneumatic forms, made of rubberized nylon, are fabricated by the Aviation Products Division of Goodyear Tire and Rubber Company, in shapes which permit the erection of half-barrel, spherical, cylindrical, elongated and semi-spherical buildings, along with straight side-walls and rectangular floor plans.

Source for the nylon base fabric: Wellington Sears. Though the neoprene hides the nylon, Wellington Sears is proud to play this supporting role, as it does in so many other cases. This is but one of the long list of base fabrics engineered by Wellington Sears for rubber, neoprene or vinyl coatings. More than likely, our century of experience can be useful to you, in solving your problem. If it involves natural or synthetic fabrics in combination with rubber or plastic, call on Wellington Sears. For informative booklet, "Fabrics Plus," write Dept. G-1.



## Wellington Sears

**FIRST In Fabrics For Industry**

*For Mechanical Goods, Coated Materials, Tires, Footwear and Other Rubber Products*

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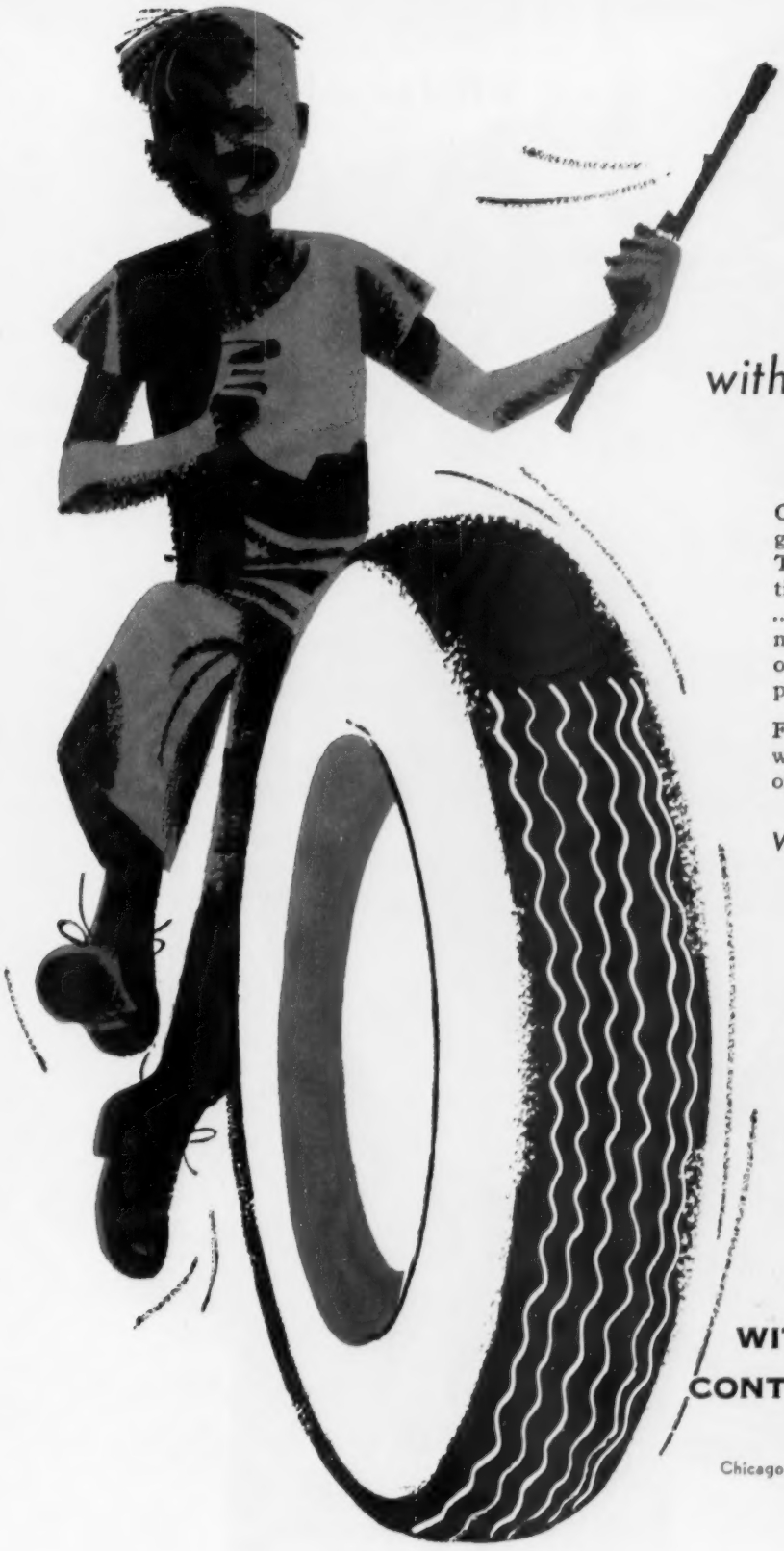

# ROLLING ALONG

## *with the rubber industry*

Over the years, Witco-Continental has grown steadily with the rubber industry. This planned expansion of our plant facilities...research and technical laboratories ...places us in an excellent position to meet every rubber black need and to assist our customers with their carbon black problems.

For prompt, integrated service, phone or write your nearest Witco-Continental office.

### *Witco-Continental* CARBON BLACKS

**FURNACE BLACKS**

**Continex® SRF**—Semi-Reinforcing
**Continex SRF-NS**—Non-Staining
**Continex HMF**—High Modulus
**Continex HAF**—High Abrasion
**Continex FEF**—Fast Extruding
**Continex ISAF**—Intermediate Super Abrasion
**Continex CF**—Conductive Furnace

**CHANNEL BLACKS**

**Continental® AA**—(EPC)—Witco No. 12
**Continental A**—(MPC)—Witco No. 1
**Continental F**—(HPC)—Witco No. 6
**Continental R-40**—(CC)—Conducting

WITCO *37 Years of Growth*

**WITCO CHEMICAL COMPANY**

**CONTINENTAL CARBON COMPANY**

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San Francisco • London and Manchester, England

KO-BLEND ...
the best way known
to assure
flawless whitewalls

## In white sidewall stock,

# KO-BLEND

## is your protection against

- SULFUR BLOOM
- POOR SULFUR DISPERSION
- MOLDING DEFECTS

For less than ½¢ per whitewall tire you can add the small amount of Ko-Blend necessary to reduce rejects and reworks to a minimum. Ko-Blend is a latex-compounded masterbatch containing 85% insoluble sulfur which has been colloidally dispersed in GRS latex.

The extremely short milling time necessary to incorporate Ko-Blend makes it possible to maintain high Mooney viscosity in whitewall stocks while overcoming processing difficulties encountered when other types of sulfur are used. For samples and further information on how Ko-Blend eliminates spots, streaks and batch softening, write to:

THE GENERAL TIRE & RUBBER COMPANY
**Chemical Division**
AKRON, OHIO

*Creating Progress Through Chemistry*

Chemical Division GENERAL
THE GENERAL TIRE & RUBBER CO.
KO-BLEND

# Boost Production UP

## Keep Temperature DOWN

**with RECLAIMATOR RECLAIMS**

***More OUTPUT because:***

- **Your batch size goes up 10%.**
- **You get 1½ more batches per Banbury hour.**

***More USABLE COMPOUND because:***

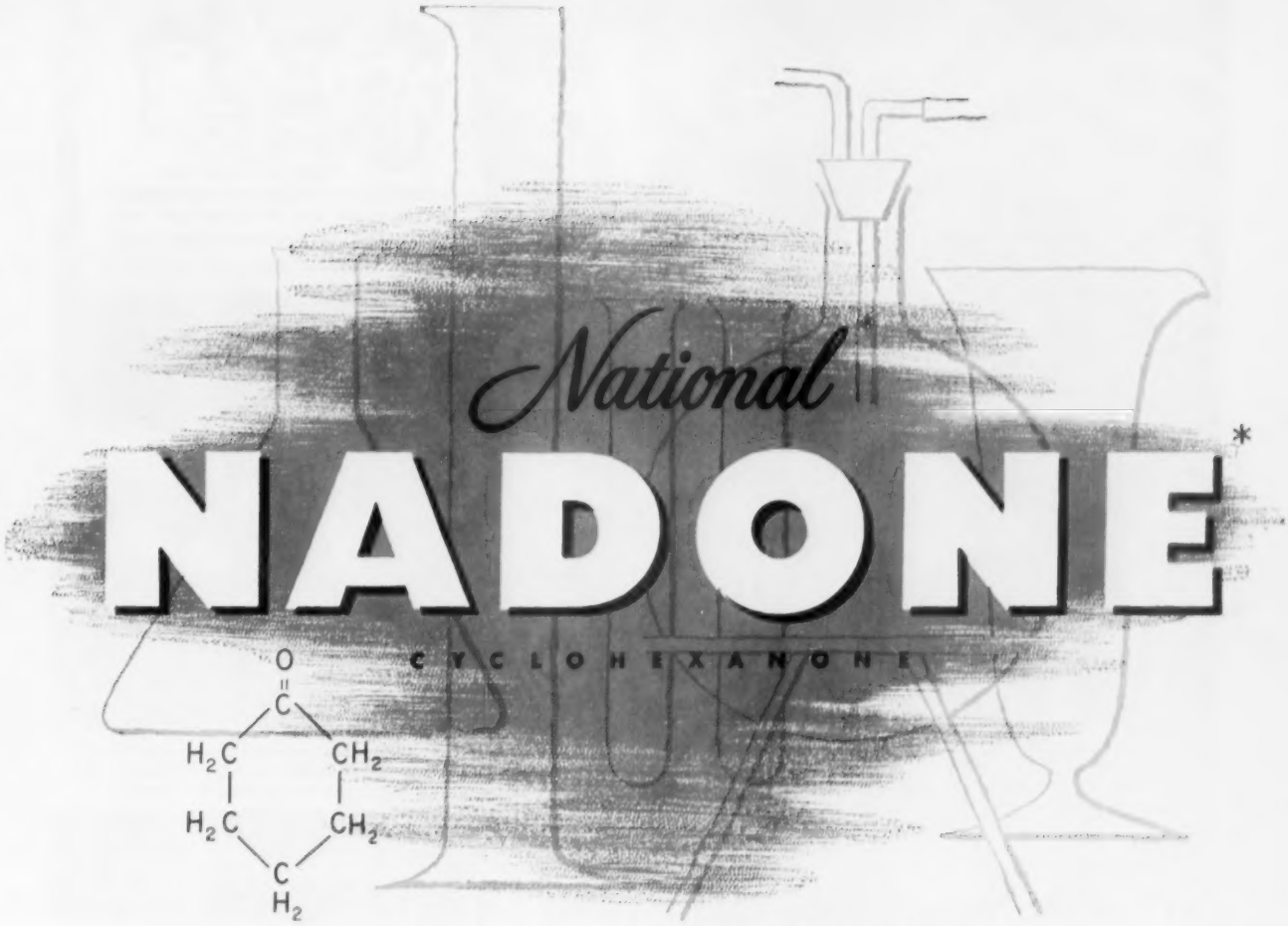
- **Cooler mixing gives less scorched compound.**
- **Right plasticity gives better dispersion.**

*Write for full details to:*

**U. S. Rubber Reclaiming Co., Inc., P. O. Box 365, Buffalo 5, N. Y.**
**Trenton Agent: H. M. Royal, Inc., 689 Pennington Ave., Trenton, N. J.**

***73 Years Serving the Industry Solely as Reclaimers***

**U.S. RUBBER RECLAIMING CO., INC.**
P.O. BOX 365 BUFFALO 5, N. Y.




# *new higher-quality cyclohexanone from a new basic source!*

NADONE is the brand name for National Cyclohexanone . . . highest quality volume-production cyclohexanone offered. Minimum purity 99.0%!

National Aniline now gives the resin, plastics, coatings and chemical industries a dependable new source of supply. Production is fully integrated within Allied Chemical and volume is freely available in tank cars or drums from our well-situated plant at Hopewell, Virginia.

Working samples of NADONE are available to show prospective users its exceptional quality.

Bulletin I-19 gives properties, reactions, suggested uses and bibliography. Use the convenient coupon.

**NATIONAL ANILINE DIVISION**
**ALLIED CHEMICAL & DYE CORPORATION**
**40 RECTOR STREET, NEW YORK 6, N. Y.**

Akron Atlanta Boston Charlotte Chattanooga Chicago Columbus, Ga. Greensboro Los Angeles New Orleans Philadelphia Portland, Ore. Providence Richmond San Francisco Toronto

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G-6

'Mike' and 'Moe' SAY:
"TAKE IT FROM US... THIS NEW SILICONE DEFOAMER KILLS FOAM AS EFFICIENTLY AND ECONOMICALLY AS DOW CORNING MOLD LUBRICANTS RELEASE RUBBER."

This underwater photo dramatically illustrates speedy dispersibility of new Dow Corning Antifoam B.

# NEW silicone defoamer gives you the ultimate in foam-killing convenience

# ANTIFOAM B

**FAST ACTING** New Dow Corning Antifoam B disperses immediately in aqueous solutions. No stirring or agitation required.

**READY TO USE** Just add "as is" . . . No delays for diluting or mixing. No need for extra containers.

**LASTS LONGER** Will not oil out, plate out, settle or precipitate in most applications. Ideal for continuous processing.

**STABLE** Long storage life — stays uniform even if frozen or boiled. Retains effectiveness after sterilization.

TEST

**ANTIFOAM B AT NO EXPENSE...**
Write, wire or phone today for a generous FREE SAMPLE and full particulars . . .

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DOW CORNING SILICONES

Address Dept. 9213.

## DOW CORNING CORPORATION
### Midland, Michigan

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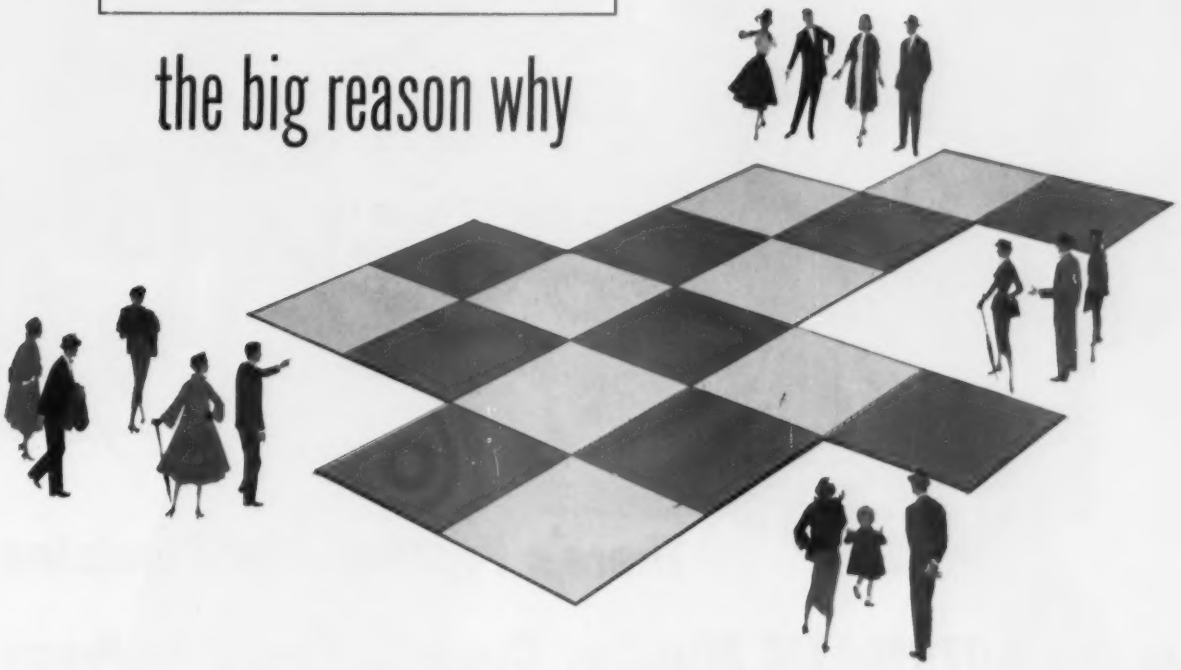
# PERMANENCE...

## the big reason why



# PLASTOLEIN® 9720 Polymeric
## is preferred for vinyl floor tile

It will pay you to investigate Plastolein 9720 Polymeric because it provides the extreme permanence and durability so vital to the life of your vinyl flooring. This results primarily from 9720's outstanding performance relating to such factors as dimensional stability, heat and light stability, volatility, and extraction.

Plastolein 9720 also offers these cost reducing advantages: low plasticizer cost, relatively high efficiency, low filler absorption, and the efficiencies of easy processing. Also, though 9720 is a polymeric, its relatively low viscosity permits the economies of bulk shipping and handling.

With all these advantages, why not try Plastolein 9720 in your vinyl tile formulations—or in any formulation where permanence is essential.

For complete details on 9720 or any of the Plastolein Plasticizers, mail coupon below:

Emery

Organic Chemical
Sales Department

Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio

Emery Industries, Inc., Dept. U-1, Carew Tower, Cincinnati 2, Ohio

Please send 32-page Emeryfacts describing all the Plastolein Plasticizers.

Name.....Title.....

Company.....

Address.....

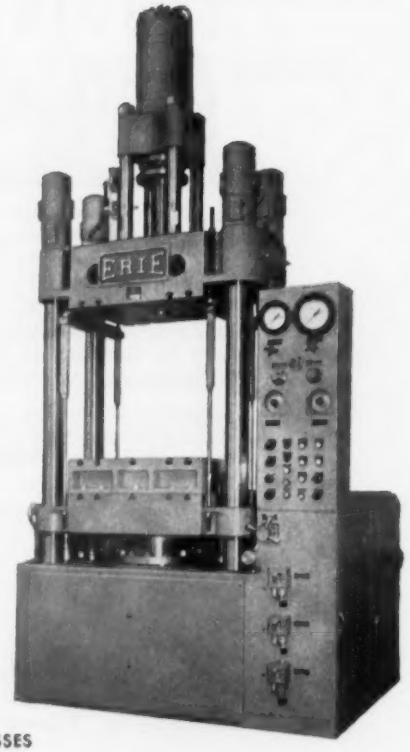
City.....State.....

# There's Panther-like Precision in the AUTOMATIC Molding Cycle of this Erie Press

If you're molding critical materials, this self-contained Erie Foundry Press will give you accuracy in controlling tonnages and pressing time for every heat. It has a separate timer on both the 200-ton main ram and the 55-ton transfer cylinder. The press is completely flexible as to tonnage, speed, and position. Fast advance—up to 270″ per minute; fast return—up to 240″ per minute; with speeds provided by two double-acting cylinders. In addition, the bottom hydraulically-operated knock-out mechanism and mechanical top mold knock-out make short work of stripping.

Because you can use any desired combination of this machine's accurate controls for each specific transfer or compression molding job, this Erie Foundry Press gives you remarkable flexibility.

And . . . you'll get "quick-as-a-panther" advice and service from us if you want more details on this press . . . or other Erie Foundry presses. Just call or write.




ERIE

**ERIE FOUNDRY CO.**

**ERIE, PA.**

SINCE 1895 — THE GREATEST NAME IN HYDRAULIC PRESSES

# HOW TO GET HIGHER MODULUS WITH HI-SIL® 233

Since the introduction of Hi-Sil 233 to the trade two years ago this month, there has been an overwhelming shift to this newer reinforcing silica from our original product, Hi-Sil 101.

Despite the lower cost of Hi-Sil 233, some compounders have been reluctant to convert their recipes because of the slightly lower modulus imparted by this pigment. This has been particularly the case with certain nitrile compounds, especially some of those designed for oil field supplies.

To provide all the advantages of lower cost and considerably improved strength properties for such uses, a rather extensive laboratory study has been completed to determine suitable methods for increasing modulus of nitrile stocks.

The results of this work are now in print as Hi-Sil Bulletin No. 11. Four techniques are reported for raising modulus of Hi-Sil 233—nitrile formulations.

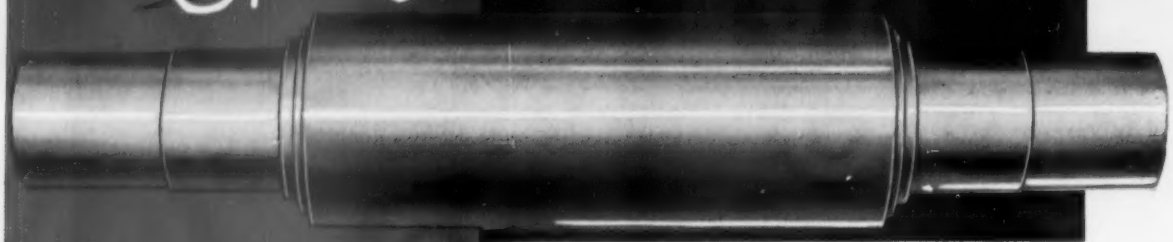
This bulletin is available on request, along with fresh samples of Hi-Sil 233 if your laboratory supply is running low. Please address your inquiries to Room 1929-A at Pittsburgh, or any of the district sales offices.

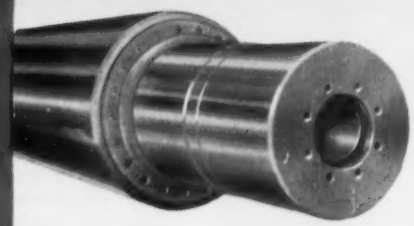
**COLUMBIA-SOUTHERN CHEMICAL CORPORATION**
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

DISTRICT OFFICES: Cincinnati • Charlotte • Chicago • Cleveland
Boston • New York • St. Louis • Minneapolis • New Orleans • Dallas
Houston • Pittsburgh • Philadelphia • San Francisco
IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

Where
**UNIFORMITY**
**PRECISION**
**DEPENDABILITY**
are factors . . . *Specify*

**UNITED®**
*DRILLED-TYPE*
**ROLLS**





**for the precision calendering of**
**PLASTICS**
**RUBBER**
**TILE**
**LINOLEUM**
**or any materials requiring close heat control**

UNITED Precision Ground, DRILLED-TYPE ROLLS, the result of careful metallurgical control over raw materials, and of strict quality control in every phase of manufacture . . .

MAINTAIN A UNIFORM ROLL SURFACE TEMPERATURE throughout, with minimum deviation at any point.

ASSURE FULL RANGE HEATING and cooling over wide temperature ranges.

PROVIDE ACCURATE, QUICKLY RESPONSIVE TEMPERATURE CONTROL.

UTILIZE FULL ROLL FACE with new, ring closure type designs.

PERMIT ADJUSTMENT OF RING CLOSURE GASKET AND BOLTS, WITH ROLL IN PLACE in calender or mill, thus eliminating production downtime due to roll removal.

MAINTAIN CORRECT DEPTH OF CHILL for iron or alloy iron rolls.

ARE ENGINEERED AND DESIGNED FOR MAXIMUM HEAT TRANSFER RATE with accurately drilled, fluid passages.

*Our more than 50 years' experience in the design and manufacture of rolls can be helpful in solving your processing problems. Your inquiry is solicited.*

# UNITED

**ENGINEERING AND FOUNDRY COMPANY**
**PITTSBURGH, PENNSYLVANIA**

*Plants at* • Pittsburgh • Vandergrift • Youngstown Canton • Wilmington (Lobdell United Division)
SUBSIDIARIES: Adamson United Company, Akron, Ohio
Stedman Foundry and Machine Company, Inc., Aurora, Indiana

Designers and Builders of Ferrous and Non-Ferrous Rolling Mills, Mill Rolls, Auxiliary Mill and Processing Equipment, Presses and other heavy machinery. Manufacturers of Iron, Nodular Iron and Steel Castings and Weldments.

In 1957

UNITED
CARBON
BLACKS

will serve you well!

# DIXIE 35

Dixie 35 (GPF), general purpose furnace, is a remarkably versatile black with properties streamlined in keeping with today's demands.

Dixie 35 was purposely developed to provide the easy mixing, fast processing, and increased reinforcement normally derived from the use of more than one type black.

Dixie 35 has also other desirable features, such as high resiliency, low heat build-up, good flex resistance, and of course exceptional uniformity.

United blacks are quality blacks commanding confidence everywhere because they do such an excellent job.

For product recognition, specify United. You stand to gain so much.

---

**UNITED CARBON COMPANY, INC.**

A subsidiary of United Carbon Company

**CHARLESTON 27, WEST VIRGINIA**

| | | |
|---|---|---|
| NEW YORK | AKRON | CHICAGO |
| BOSTON | LOS ANGELES | MEMPHIS |

IN CANADA: CANADIAN INDUSTRIES LIMITED

# AZODOX

TRADE MARK

## New, Higher Density Zinc Oxide

## INCREASES MIXING CAPACITY ... SPEEDS PRODUCTION

### HERE ARE OTHER REASONS WHY AZODOX IS BEST FOR YOU

**Twice the Density, Half the Bulk.** Cuts storage space in half. Despite high density, perfect texture of material is unchanged. AZODOX package is shaped, permitting close-packed, well-formed unitized shipments.

**Flows More Freely, Less Dusting** than conventional zinc oxides.

**Physical Properties Unchanged Except for Density.** Surface area, size and shape, color and all other physical properties of AZO-ZZZ, American Process, zinc oxides are unaltered. *Apparent density only is changed.* All chemical properties are unchanged.

**AZODOX Cuts Your Costs.** Faster handling, easier storing, quicker mixing save you money.

**AZODOX** now ready for you in unlimited quantities. Priced the same as conventional zinc oxides. Available in surface treated form if desired.

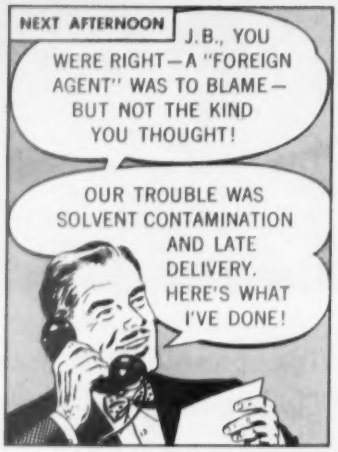
Tests prove AZODOX, new form of zinc oxide (de-aerated), to be superior in all mixing operations. AZODOX incorporates readily, disperses completely in both hard and soft stocks, at high or low concentrations, on the mill or in the Banbury. Hard crust, common to pellets, is never present to cause dispersion problems. *Unlike pellets AZODOX does not consist of agglomerates.*

**AZODOX** is available in all grades of American process lead-free zinc oxide.

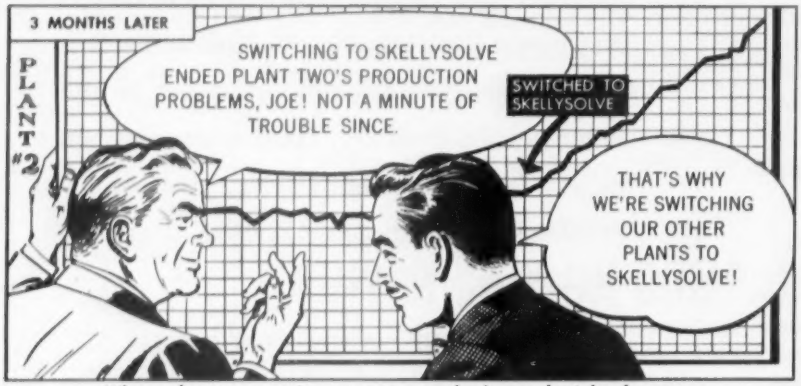
**American Zinc sales company**

*Distributors for*
AMERICAN ZINC, LEAD & SMELTING COMPANY
COLUMBUS, OHIO • CHICAGO • ST. LOUIS • NEW YORK

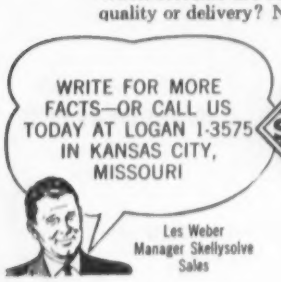
THE CASE OF THE
FOILED FOREIGN AGENT
JOE, I KNOW THIS SOUNDS RIDICULOUS BUT PRODUCTION LOSS IN PLANT TWO IS SO HIGH IT SEEMS LIKE SABOTAGE!
I'LL RUN OUT THERE AND LOOK INTO IT MYSELF, J.B.!


NEXT AFTERNOON
J.B., YOU WERE RIGHT—A "FOREIGN AGENT" WAS TO BLAME—BUT NOT THE KIND YOU THOUGHT!
OUR TROUBLE WAS SOLVENT CONTAMINATION AND LATE DELIVERY. HERE'S WHAT I'VE DONE!

...SWITCHED TO SKELLYSOLVE, EH?
YOU SAY SKELLYSOLVE IS CONSTANTLY CHECKED DURING PRODUCTION AND BEFORE SHIPMENT?
TECHNICAL SERVICE BACKED BY OVER 25 YEARS OF EXPERIENCE?
...NINE OUT OF TEN CARS SHIPPED DAY AFTER ORDERS RECEIVED.
SOUNDS GREAT! GOOD WORK, JOE!


3 MONTHS LATER
PLANT "2"
SWITCHING TO SKELLYSOLVE ENDED PLANT TWO'S PRODUCTION PROBLEMS, JOE! NOT A MINUTE OF TROUBLE SINCE.
SWITCHED TO SKELLYSOLVE
THAT'S WHY WE'RE SWITCHING OUR OTHER PLANTS TO SKELLYSOLVE!

**When solvents are so important** to your business, why take chances on quality or delivery? Next time you order specify Skellysolve.




SKELLY

# Skellysolve

**SKELLY OIL COMPANY**

**Industrial Division**

**605 West 47th Street, Kansas City 41, Mo.**

## Skellysolve for Rubber and Related Industries

**APPLICATIONS**

**SKELLYSOLVE-B.** For making quick-setting cements for the shoe, tape, container, tire and other industries. Quick-drying, with no foreign taste or odor in dried compound. Closed cup flash point about -25°F.

**SKELLYSOLVE-C.** For making quick-setting cements with a somewhat slower drying rate than those compounded with Skellysolve-B. Closed cup flash point about 13°F.

**SKELLYSOLVE-H.** For general use in manufacturing operations and cements, where faster evaporation rate than that of Skellysolve-C is desired. Closed cup flash point about -16°F.

**SKELLYSOLVE-L.** For general manufacturing operations where a medium evaporation rate is required. Closed cup flash point about 12°F.

**SKELLYSOLVE-R.** For general use in tire building and a variety of other manufacturing operations and cements. Reduces evaporation losses. Medium quick final dry. Lessens bloating and skinning tendency. Closed cup flash point about -25°F.

Ask about our new Skelly Petroleum Insoluble Grease

# New! Free-Flowing, High Density Sterling® MT

MEDIUM THERMAL CARBON BLACK

Cabot's new free-flowing, high density Sterling MT is now available in full commercial quantities — at no increase in price!

New Sterling MT is manufactured to the same exacting chemical specifications as regular MT, but through new mechanical processing methods, bulk density is increased 25–30% and fines and dust are greatly reduced. The result is a happy combination of improved mixing characteristics with unchanged vulcanizate properties, plus storage savings through lower volume packaging.

Free-flowing Sterling MT looks and acts almost like regularly pelleted black. It flows more quickly and easily from the bag, incorporates faster into the batch, makes for easier handling, quicker weighing, better unit loads, and contributes generally to cleaner and more economical plant working and storage conditions.

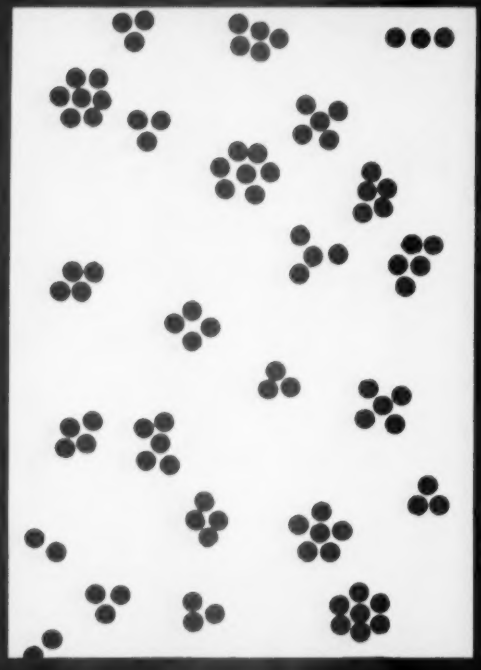
Specify the new FREE-FLOWING STERLING MT grade on your next Cabot order and see the difference for yourself. Contact your nearest Cabot sales office or

**GODFREY L. CABOT, INC.**
77 FRANKLIN STREET, BOSTON 10, MASS.

CABOT

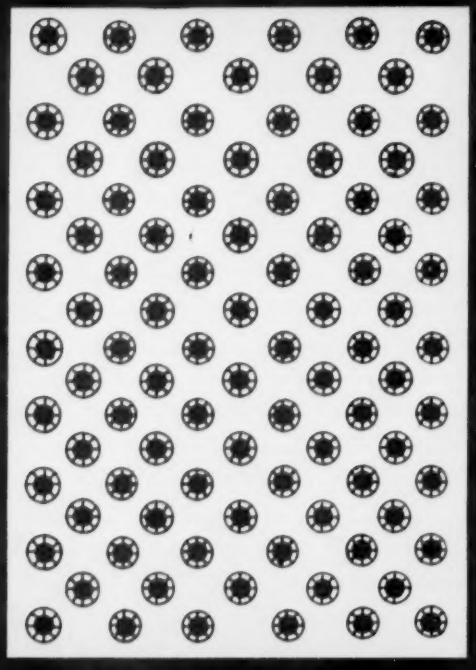
FREE SAMPLES . . . TECHNICAL LITERATURE

# WHICH ZINC OXIDE IS YOURS?



**CONVENTIONAL ZINC OXIDE**

Conventional zinc oxide disperses in rubber more slowly than Protox-166 because its particles are generally highly aggregated, especially in cold or humid weather.



**PROTOX-166 ZINC OXIDE**

Protox-166 zinc oxide disperses in rubber readily and improves modulus because the particles are predispersed and coated with zinc propionate.

These illustrations show schematically the marked difference between particles of Protox-166 and those of conventional zinc oxide. Protox-166 is essentially free of aggregates because the particles are coated with zinc propionate. That patented* coating, exclusive with Protox zinc oxides, imparts the following properties to the pigment:

1. Insulates the particles from one another
2. Reduces moisture pickup in humid atmospheres
3. Provides an organophilic surface readily wet by rubber
4. Increases bulk density

These properties cut your processing costs and improve the quality of your products in these ways:

1. Faster incorporation and dispersion in rubber
2. Less need to masterbatch zinc oxide
3. Higher modulus

*U. S. Patents 2,303,329 and 2,303,330

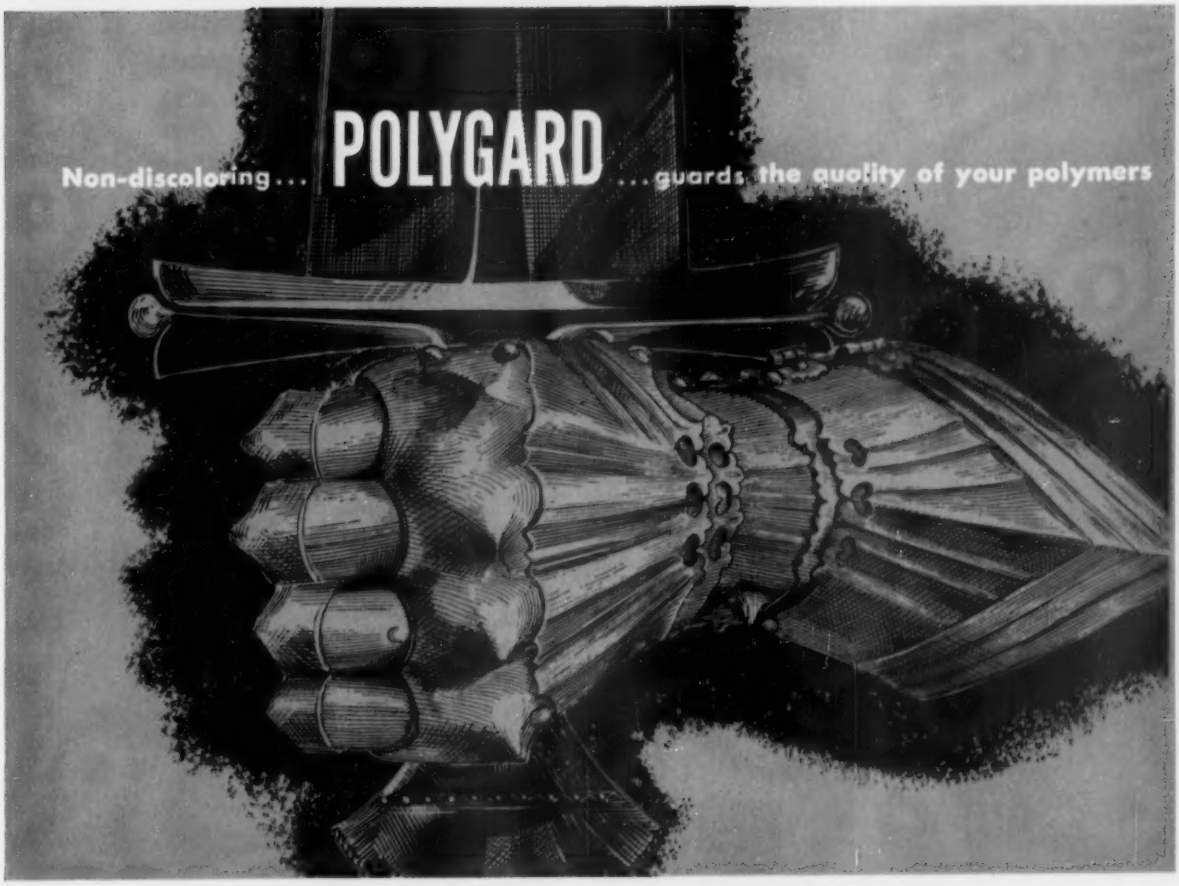
**THE NEW JERSEY ZINC COMPANY**

*Producers of Horse Head Zinc Pigments*

*... most used by rubber manufacturers since 1852*

**160 Front Street, New York 38, N. Y.**

## Naugatuck Polygard




**...during manufacture, storage, processing, and use**

AS A STABILIZER for *all* types of rubber latices, and for the manufacture of nonstaining synthetic polymers, POLYGARD®:

- **prevents resinification of the polymer during manufacture and storage,**
- **guards against heat and oxygen degradation during processing,**
- **resists cut-growth degradation caused by gel and resinification.**

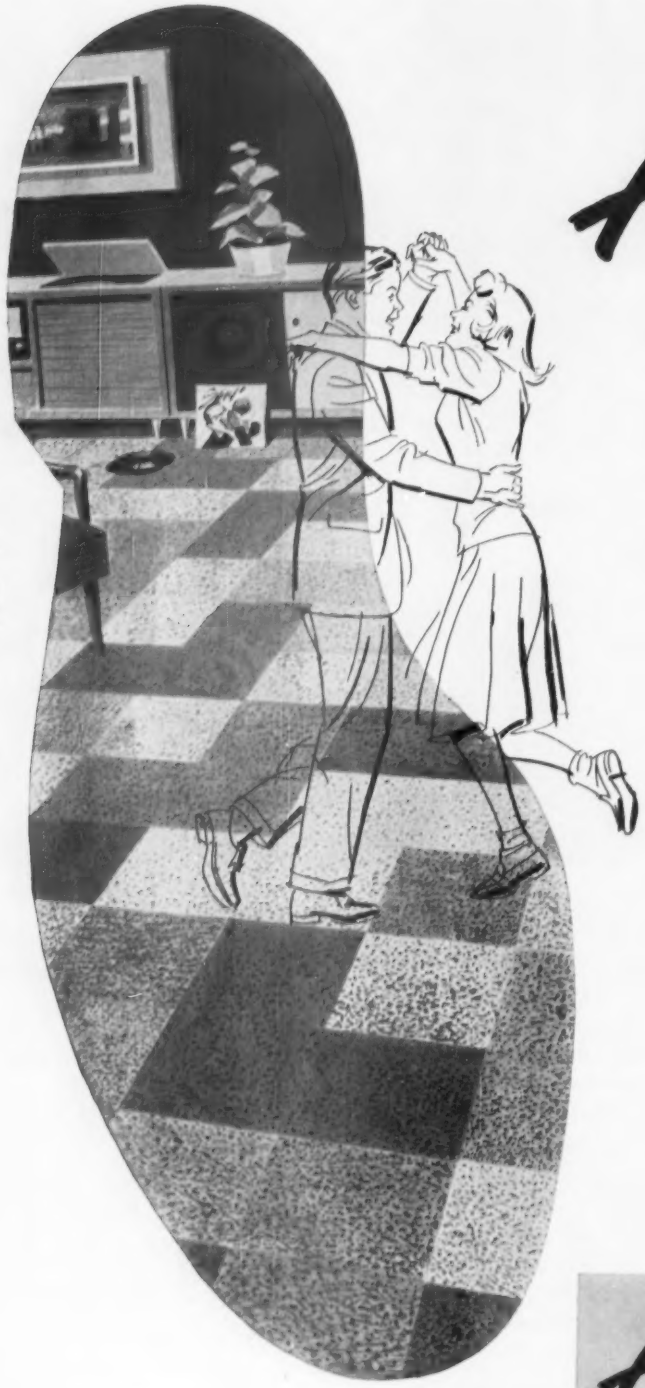
POLYGARD has the added advantage of being *non-discoloring, nonstaining* and *odorless!* Added to the polymer emulsion prior to flocculation, POLYGARD's superior protective action is not diminished by the acid serum commonly encountered in coagulating R-S rubber. Because of its liquid form it disperses easily and uniformly in the emulsion. May we send you more detailed data?

**Naugatuck Chemical**

**Division of United States Rubber Company**
**Naugatuck, Connecticut**

IN CANADA: NAUGATUCK CHEMICALS DIVISION • Dominion Rubber Company, Limited, Elmira, Ontario • Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N.Y.

# Goodrich-Gulf Chemicals, Inc.



## Ameripol...

### preferred rubber for casual feet or high style flooring

THE same long-wearing qualities that make Ameripol man-made rubber the preferred material for shoe soles and heels enhance rubber floor tile too. Here a new value is added—beauty.

Floor tile of Ameripol is made in dramatic patterns and colors. Oxidation is held to a minimum, thus original colors last. A tough, smooth surface is easy to keep clean.

Ameripol is a superior material in many respects—resistance to wear, weathering ability, ease of processing into complicated shapes. It's ideal for a wide range of industrial and commercial products . . . from conveyor belts to extruded window gaskets. Use these advantages in *your* products. For technical information write for the new booklet "Ameripol".

Ameripol RUBBER

Cold Non-Oil Polymers
•
Cold Oil-Extended Polymers
•
Hot Non-Oil Polymers

**Goodrich-Gulf Chemicals, Inc.**
3121 Euclid Avenue • Cleveland 15, Ohio

THE NAME TO REMEMBER FOR QUALITY BACKED BY YEARS OF RESEARCH AND EXPERIENCE

# DON'T DOUBT IT! DO IT!

## MOLD VINYL HOLLOW GOODS AUTOMATICALLY

**MORE ADAPTABILITY! MORE PRODUCTION! MORE PROFITS!**

AUTOMATICALLY MOLD AS MANY AS 1620 ITEMS EVERY HOUR
PROCESSED FROM LIQUID PLASTISOL TO A RESILIENT PRODUCT IN ONE CYCLE
COMPLETE OPERATION BY JUST ONE MAN

### THIS IS WHAT HAPPENS — AUTOMATICALLY

The above machine converts raw materials into finished goods in one continuous operation. The operator doesn't have to be a technician because all the polyvinyl chloride plastisols are scientifically prepared for you and the automatic features of the machine control the cycle completely. The operator handles only the raw materials and the finished product. The research and technical staffs of many of the nation's foremost companies are available to work out the best formulation for *your* product. You need only be concerned with speed and production.

### CONSIDER THE NEW POSSIBILITIES!

*Now* any hollow article can be molded from vinyl plastisol, vinyl foam or polystyrene expandable beads because this machine adjusts easily to suit all conditions. Think of the new jobs, new orders, bigger profits which can be yours. Think of the many things which now become practical and profitable for you to produce.

### ASK FOR MORE INFORMATION — SEE MACHINES OPERATE

Let us show you facts and figures. Let us show you the machine in operation. Let us show you *your own product* being made. Let us make arrangements for your visit to our plant.

## THE AKRON PRESFORM MOLD CO.

**Phone WA 8-2105**

**Cuyahoga Falls, Ohio**

| FORMS | MOLDS | DIES | MACHINERY |
|---|---|---|---|
| LATEX DIPPING | STEEL AND ALUMINUM | PLASTIC INJECTION | SPECIAL AUTOMATIC |

ENGINEERS SERVING THE RUBBER AND PLASTICS INDUSTRY FOR OVER 30 YEARS

# *Is AUTOMATION the Answer . . . for You ?*

What yardstick can a management man use to evaluate Automation for his company?

Will it increase productivity, decrease costs, improve product quality—and to what degree? What capital investment is required, and how can it be amortized?

These are the questions which must be answered. They are the kind of problems which clients regularly bring to G & V for analysis and solution.

Giffels & Vallet's broad experience in the planning and engineering of production facilities . . . for many companies in many industries . . . at home and abroad . . . has brought about a practical insight and understanding of the complex problems involved . . . and their solution.

*This is experience available to you—in the development of new plant facilities and modernization programs.*

G & V services are discussed in a special Rubber and Plastics Brochure. A copy will be mailed on request.

INDUSTRIAL ENGINEERING DIVISION

**Giffels & Vallet inc.**

DETROIT 26, MICHIGAN New York, Chicago, Houston

*Canadian Affiliate: Giffels & Vallet Ltd., Toronto and Windsor*

Plant Layout • Process Development • Automation Engineering • Materials Handling • Equipment Design • Building Design

# THE Thiokol RUBBER REPORTER

**GASKETS AND DIAPHRAGMS** molded from "Thiokol" Synthetic Rubbers are highly impermeable to moisture, gases and most aliphatic and aromatic liquids.

**LOW TEMPERATURE FLEXIBILITY.** "Thiokol" synthetic rubbers have a broad service temperature range, running all the way from —60°F., without the use of low temperature plasticizers, to +250°F.

# Versatile "Thiokol" Synthetic Rubbers Have Wide Range of Applications

## TOUGH, SYNTHETIC RUBBERS BY "THIOKOL" SERVE INDUSTRY IN MANY WAYS

- Paint Spray, Gasoline and Aromatic Fuel Hose
- Coated Paper Gaskets
- Printing and Coating Rollers
- Permanent Putties
- Molded Diaphragms and Gaskets

**"Thiokol" Synthetic Rubbers provide:**

- resistance to oils and solvents
- low temperature flexibility
- resistance to sunlight, ozone and aging
- impermeability to gases, moisture and liquids
- adhesion as putties to glass, metals, wood and plastics

**Solvent-resistant hose.** Hose made from "Thiokol" synthetic rubber is used successfully with the most deteriorating organic solvents. It displays outstanding resistance to paints and paint thinners, lacquers, aliphatic and aromatic liquids.

**Coated Paper Gaskets.** Inexpensive paper gaskets are made tough and oil-resistant with uncured "Thiokol" synthetic rubber. Coating is accomplished quickly and easily by rolling, spreading or dipping.

**Printing and Coating Rollers.** Outstanding resistance to swelling in aliphatic and aromatic solvents makes "Thiokol" synthetic rubber ideal for fabrication of lacquer, paint and inking rollers.

**Permanent Putties.** Versatile putties made from "Thiokol" Synthetic Rubbers have found wide acceptance in the building, marine and maintenance fields. They resist major causes of deterioration, including solvents, chemicals, sunlight, aging and weathering.

**Molded Diaphragms and Gaskets.** Washers, gaskets and diaphragms made of "Thiokol" synthetic rubber give the ultimate in oil and solvent resistance . . . are unaffected by aging and stay flexible over a wide temperature range.

For more technical information about "Thiokol" Synthetic Rubbers, write: THIOKOL CHEMICAL CORPORATION, 784 NORTH CLINTON AVE., TRENTON 7, N. J. In Canada: Naugatuck Chemicals Division, Dominion Rubber Company, Elmira, Ontario.

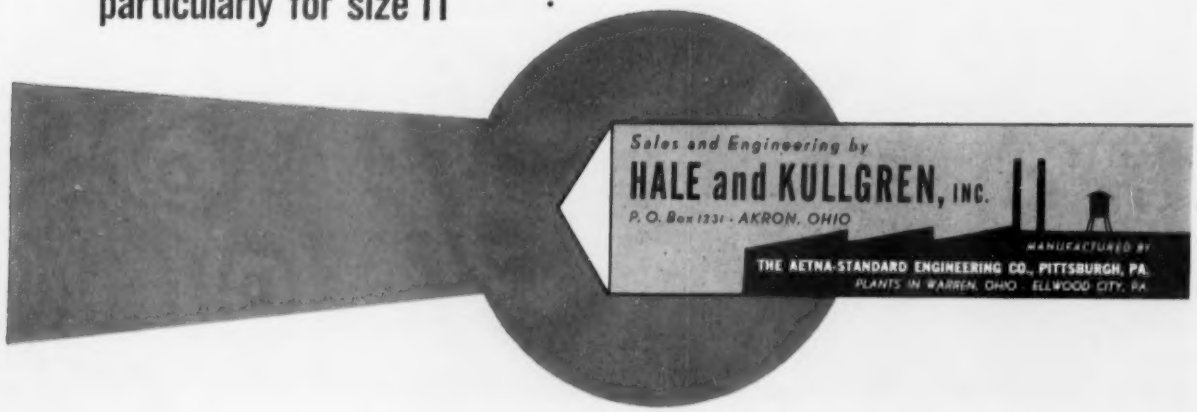
Thiokol®

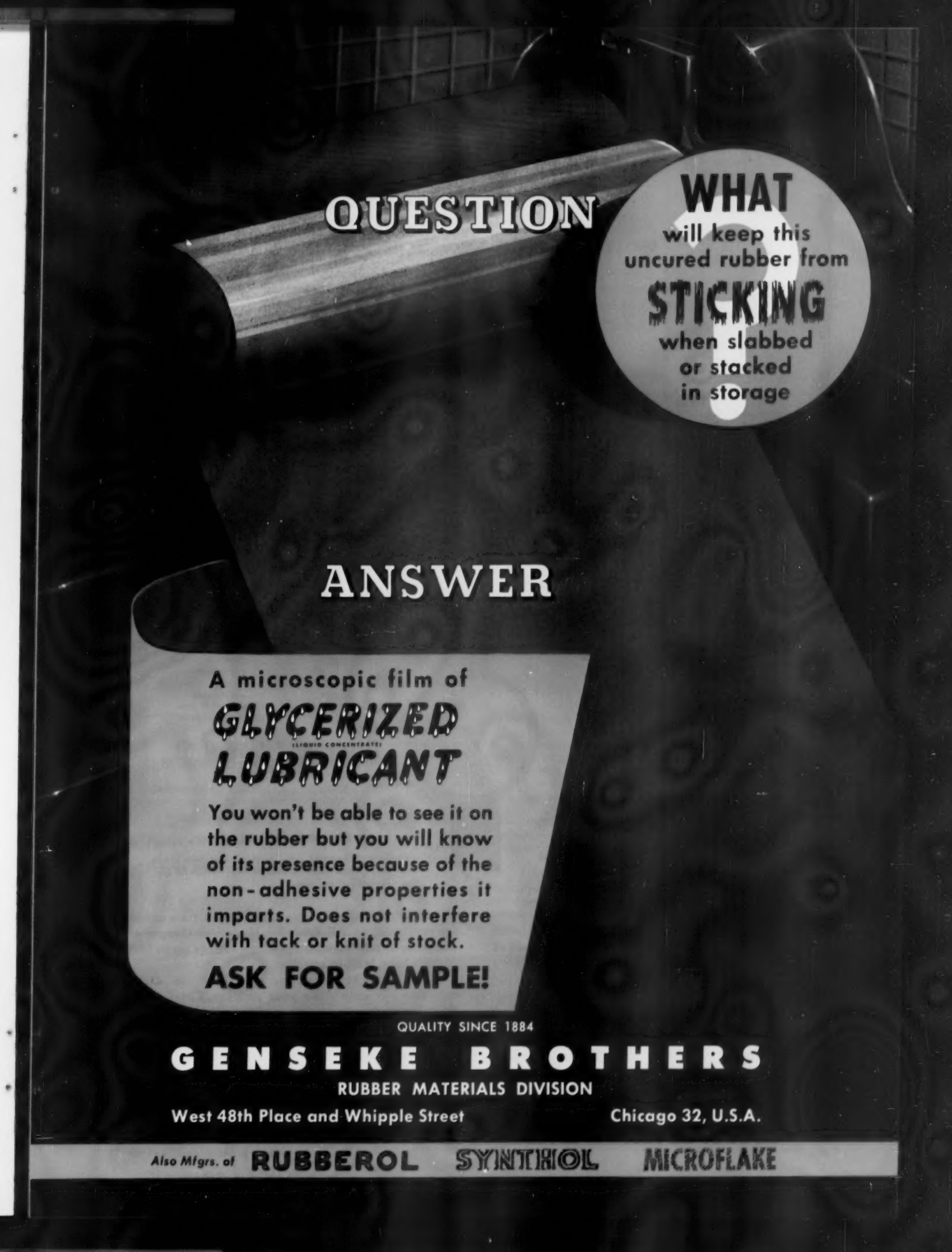
PIONEER MANUFACTURERS OF SYNTHETIC RUBBER

# repair service on BANBURYS

We have PATTERNS and can supply any part . . . we stock many of them, particularly for size 11

- √ We build parts to original patterns.
- √ New ideas in Banburys.
- √ Parts interchangeable.
- √ Swap Service available.
- √ Many parts in stock.
- √ Good service.


Sales and Engineering by
HALE and KULLGREN, INC.
P. O. Box 1231 · AKRON, OHIO
MANUFACTURED BY
THE AETNA-STANDARD ENGINEERING CO., PITTSBURGH, PA.
PLANTS IN WARREN, OHIO · ELLWOOD CITY, PA.

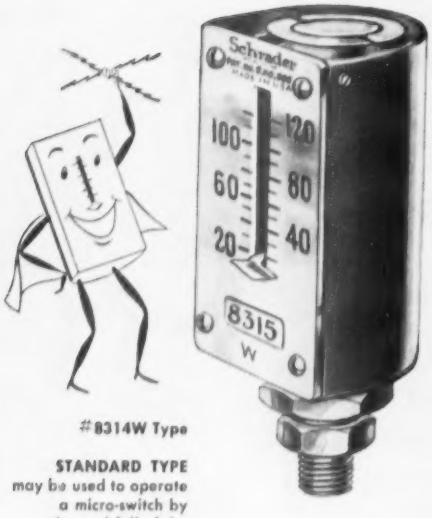

QUESTION
WHAT
will keep this
uncured rubber from
STICKING
when slabbed
or stacked
in storage
?
ANSWER
A microscopic film of
GLYCERIZED
(LIQUID CONCENTRATE)
LUBRICANT
You won't be able to see it on the rubber but you will know of its presence because of the non-adhesive properties it imparts. Does not interfere with tack or knit of stock.
ASK FOR SAMPLE!
QUALITY SINCE 1884
GENSEKE BROTHERS
RUBBER MATERIALS DIVISION
West 48th Place and Whipple Street
Chicago 32, U.S.A.
Also Mfgrs. of RUBBEROL SYNTHOL MICROFLAKE

# SCHRADER HYDRAULIC GAUGES DO THE JOB RIGHT...

## *keep accuracy under shock and overloads!*

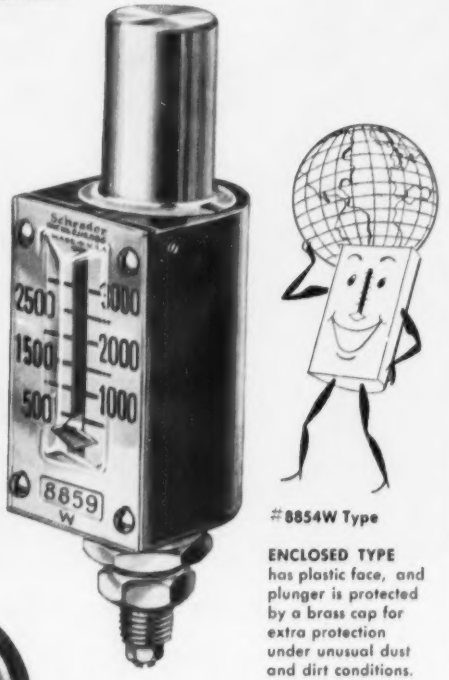
**SHOCKPROOF HYDRAULIC PRESSURE GAUGES**

**are especially useful where space is limited. Engineered for long, hard use on all types of hydraulic machines. The Standard Gauges are industry's favorites.**




#8314W Type

**STANDARD TYPE**
may be used to operate a micro-switch by rise and fall of the plunger to start another sequence, etc.




#8854W Type

**ENCLOSED TYPE**
has plastic face, and plunger is protected by a brass cap for extra protection under unusual dust and dirt conditions.

**Shock 'em**

**Overload 'em**

**HYDRODIAL TYPE**

**SHOCKPROOF HYDRODIAL PRESSURE GAUGES**

are completely enclosed units. Durable plastic face covers large, easy-to-read numerals that can be read from 50 feet. Easy to install and maintain.

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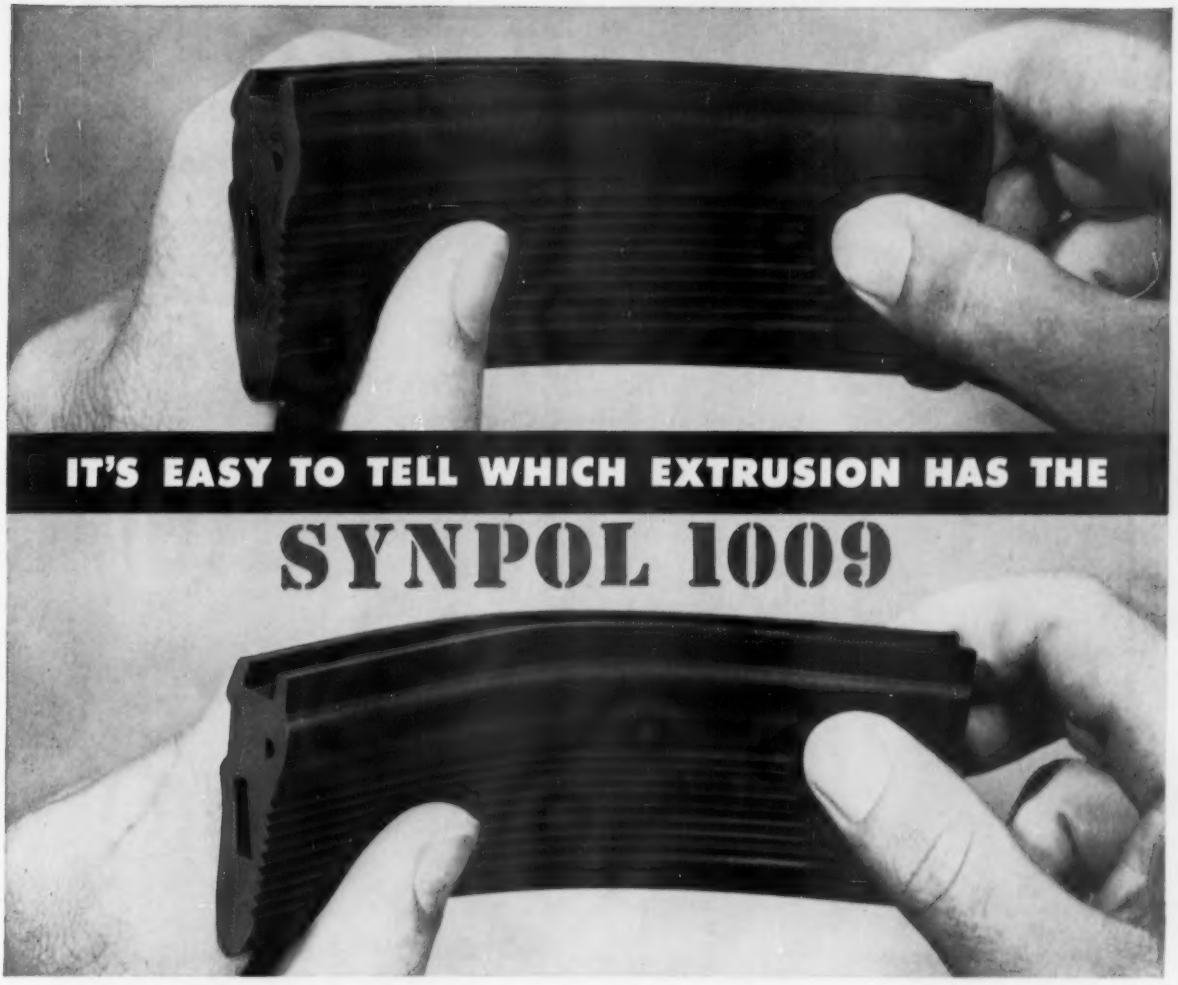

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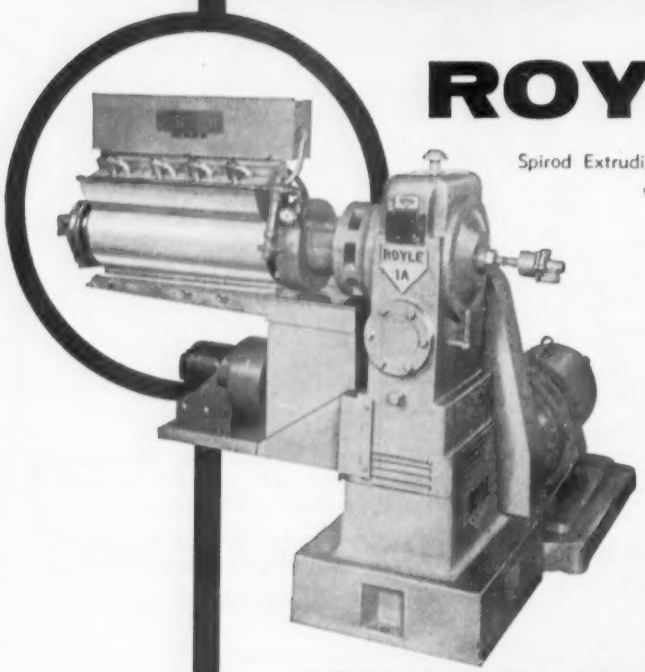


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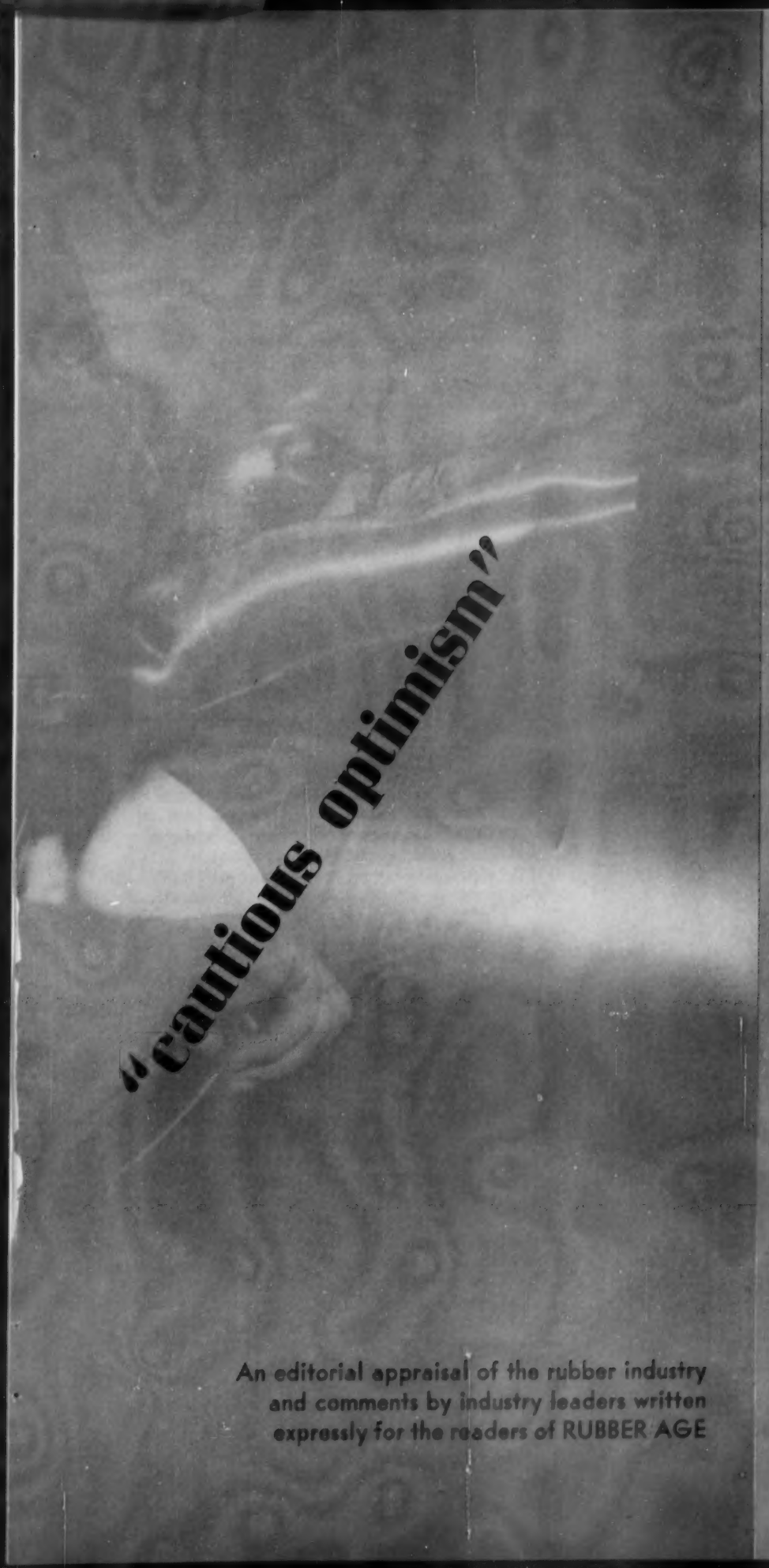

# "cautious optimism"

# 1956 review, preview 1957

An editorial appraisal of the rubber industry and comments by industry leaders written expressly for the readers of RUBBER AGE

# Editors' Round-up

THE rubber industry, as much as any other industry in the world, is an integral part of the world economic picture, contributing to the whole and sharing in the sum. Since our industry does not exist as a thing apart, any analysis or review of the current industry situation must first take into account basic economic background.

It would seem to be the consensus that general business in the United States in 1957 can be expected to rise by about 4½ per cent. That is, the value of all the goods and services produced in the United States in 1957 will approximate $430 billion against a $411 billion total for 1956. It is expected that in 1957 there will be a $9 billion rise in consumer spending, a $4 billion increase in government spending, a $4 billion increase in plant and equipment outlays, with the remaining $2 billion spread among the various remaining goods and services. With these trends as a guide to the future, it may reasonably be expected that by 1960 the gross national product should rise to the $485 billion shown in Figure 1, a gain of about 18 per cent in four years.

On this subject, Emerson P. Schmidt, director of economic research for the Chamber of Commerce of the United States, notes that the economic outlook for 1957 is conditioned heavily by recent events in the Middle East and Eastern Europe. Mr. Schmidt observes that 1956 was our best year in history in terms of employment, production and earnings. The gross national product, which ran to about $391 billion in 1955, he states, was running at the rate of about $417 billion at the close of 1956.

It should be said that while those who have predicted the gross national product for 1957 have tended to think in terms of $425 to $435 billion, part of that sum may reflect price increases. It should also be stressed in speaking of the gross national product, that the rubber industry historically accounts for 1.4 per cent of the total. This was true five, ten and even twenty years ago, and it is reasonable to assume that this percentage will hold for the foreseeable future, as also shown in Figure 1.

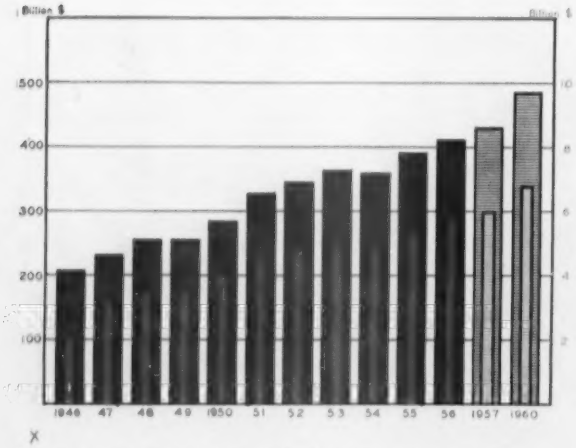


FIG. 1—U.S. Gross National Product. The red bars indicate the rubber industry's share of the total, 1946, to date, with estimates for 1957 and 1960.

## Ten Point Forecast for 1957

- Consumption of new rubber in the United States will amount to 1,500,000 long tons.
- Plant capacity for the production of butadiene-styrene rubber will reach 1,250,000 long tons.
- Exports of synthetic rubber from the United States will approach 300,000 long tons for the year.
- Tire sales—replacement and original equipment—will show an increase of 6 per cent to over 111,000,000 units.
- Sales of non-tire rubber products will account for 54 per cent of total rubber products sales value.
- Sales of all rubber goods manufacturers—including allied activities such as chemicals and plastics—will reach $6 billion.
- Capital expenditures by rubber goods manufacturers will exceed $210 million.
- A slight increase will be recorded in the per capita consumption of rubber in the United States.
- The rubber industry will continue to account for 1.4 per cent of the Gross National Product.
- There will be no major expansion in the production capacity of natural rubber.

> Commenting on the over-all situation, Secretary of Commerce Sinclair Weeks believes that, in general, 1957 will be the biggest year on record, bigger even than 1955. Barring an unforeseen national emergency, he states, major industries anticipate good production and sales for the first six months of 1957.

The United States is now moving into the third year of a recovery period which began in 1954. As any "boom" gets older, certain stresses and strains begin to develop. Certainly, it will be seen that all the favorable factors which existed in the autumn of 1954 do not exist today. As a matter of fact, many economists have observed that the general economy has been showing signs of leveling off in the past few months.

The tight money policy, so-called, was designed to slow down the economy in order that we might attain the triple goals of economic growth, high level employment and economic stability. This policy is beginning to have its intended effect. The first impact of such a policy is on the more vulnerable sectors of the economy and many individuals have

Cover photograph, courtesy Columbian Carbon Co.

already been affected. A number of problem areas calling for readjustment have already become apparent.

In order to gauge domestic economic conditions, the National Bureau of Economic Research has tried to develop barometers which measure the business future. It now finds that 75 per cent of its measurements are pointing down. A year ago, only half of these measurements were pointing down. Whether this foreshadows recession or is simply a reflection of the tight money policy is a matter which merits close and continuing attention in the months ahead.

As for the foreign trade sector, any analysis of the situation must deal largely with the effects of the Suez controversy. While U.S. exports in 1956 reached a record total of $18.5 billion, nearly 20 per cent over 1955, the future is uncertain. The Suez crisis has already upset a good many economies abroad. Europe has relied on the Suez Canal for about three-quarters of its oil, for example, and that passageway is a key link between the entire East with Europe and much of the rest of the world.

The Suez situation has already set in motion a whole series of consequences of vital import to the U.S. Take, for instance, the present situation with regard to oil. With the blocking of the Suez Canal, European consumers have had to turn to the U.S. for their requirements. This, however, resurrects the old problem of the so-called dollar gap. The English, French and other Europeans do not have the dollars to pay for the American petroleum. This means, in turn, that they must borrow dollars from the U.S. to pay for the oil imported from the U.S. What we have then is a situation in which the U.S. is paying for its own exports.

Factors such as these not only tend to complicate an appraisal of the over-all economic condition, they force specific readjustments in domestic price patterns. If we carry the example of oil exports and dollars to a logical conclusion, we see not only higher domestic gasoline prices, but increased prices for synthetic rubber.

> In balance, however, leading economists believe that we can view 1957 with mild, cautious optimism—disciplined optimism. The fundamental forces of long-run expansion and growth are strong. Population growth, new product development and research are moving forward. Incomes are up and growing. Our economy is fundamentally sound—with the favorable factors far outweighing the unfavorable.

The determination of the Administration to try to preserve the value of our currency, our life insurance and our dollars, is based on a flexible policy of sound money. As the threat of serious inflationary pressures abate, we will return to policies designed to foster growth in the money supply. This will accommodate economic expansion.

Of course, one of the factors influencing any business forecast is the state of legislation affecting the economy. What the new Congress does, for example, in such areas as tax relief, labor legislation, the Hoover Commission recommendations, foreign aid, farm programs and federal aid to schools, etc., will affect the economy.

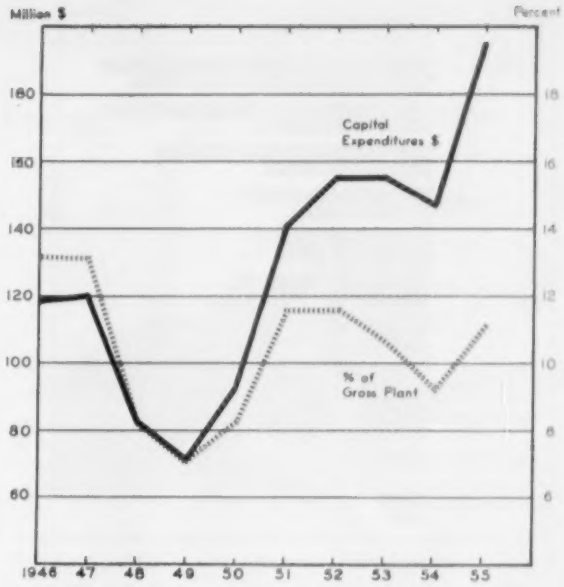


FIG. 2—Capital expenditures by selected* companies in the rubber industry showing percentage of gross plant.

One vital consideration of this survey of the economy is the matter of outlays for plant expansion. According to a joint report issued by the Department of Commerce and the Securities Exchange Commission, U.S. industry will spend at least 8 per cent more for new plants and equipment in the first three months of 1957 than was expended in the comparable period of 1956. The report notes that expansion programs will reach an annual rate of $38 billion in the first quarter of 1957. This figure compares with the annual rate of $37.3 billion in the fourth quarter of 1956 and almost $36 billion in the third quarter of 1956. According to the two agencies, the expenditures in the first three months of 1957 should be almost 5 per cent higher than in the first quarter of 1955, when the lowest recent level was established.

Government experts do point out, however, that most industries were unable to meet the expansion programs they had laid out for themselves for the third quarter of 1956 and were compelled to scale down their plant and equipment plans for the final three months of the year. While this may reflect, in part, the effect of last summer's steel strike on capital goods deliveries, it is also another reflection of the tight money policy, many economists believe. It is known, for example, that many companies paid their normal dividends in stocks rather than in cash so as to maintain a reasonable working capital.

> While we have made this brief foray into the general economic scene, the rubber industry is the part of the whole in which we express primary interest. Let us try to determine what part the rubber industry will play in the over-all picture.

* Selected companies include Baldwin, Dayton, Firestone, General, Goodrich, Goodyear, Lee, Seiberling and U. S.

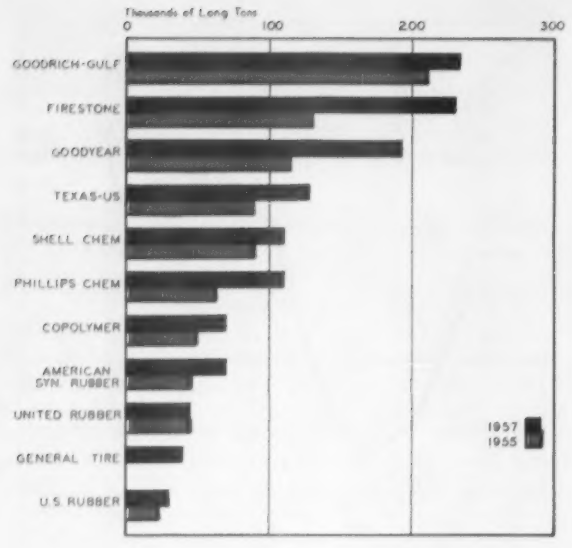


FIG. 3—Individual GR-S type plant capacities at takeover in 1955 and estimated capacities by the end of 1957.

Firstly, it can be said that this matter of plant expansion is indicative not only of the health of any industry but also of the faith which that industry places in its future. Certainly no industry will invest sizable sums in expansion programs unless it feels that there will be customers to purchase the goods ultimately produced. The rubber industry, by its capital expenditures since World War II, has exhibited such faith in its future, as will be seen in Figure 2. A study of the chart indicates that rubber companies have, since World War II, been investing a goodly percentage of their gross plant in capital expenditures.

Will this trend be carried over into 1957?

Preliminary estimates of rubber industry capital expenditures in 1956 place the total at approximately $193 million. Of this sum, U.S. Rubber spent some $32 million and has already announced a $40 million expansion program for 1957. Goodrich previously announced a $200 million expansion program covering the years 1956 to 1960. Other information of this type which has been made available suggests that total rubber industry capital expenditures in 1957 will run about 10% above 1956. It must be said, however, that other observers do not see any appreciable increase in 1957 over the $193 million expended in 1956. As it is believed that chemical industry capital expenditures in 1957 will total $1.9 billion, 29 per cent more than in 1956, and capital expenditures for all business in the U.S. will rise 11 per cent, it seems reasonable to assume that the 10% figure for the rubber industry is realistic.

Now, this talk of industry expenditures has not, up to this point, taken into account all of the major expansions planned by the producers of synthetic rubber. Some estimates show that by the end of 1957, total synthetic rubber capacity will approach 1.68 million tons in the U.S. It is interesting to note that every few months these capacities are revised upward by one source or another. For example, the first report of the Attorney General of the United States on synthetic rubber in the rubber industry, which was presented to Congress early in 1956, placed GR-S type plant capacity at 1,010,200 long tons by 1957. Another survey, recently conducted by RUBBER AGE, indicates that GR-S type plant capacity will reach 1.25 million long tons when the individual expansion programs announced by producers are totaled. Figure 3 shows estimated capacities by the end of 1957.

What has prompted the expanded view in the past few months?

It is expected that part of the increased capacity for synthetic rubber production will be used to meet rapidly growing demands from England and the Continent. Synthetic rubber exports from the U.S. and Canada in 1955 totaled 160,000 long tons and in 1956 this figure reached about 250,000 long tons. It is expected that in 1957, 300,000 long tons of synthetic rubber will be exported.

Synthetic rubber is taking the lion's share of the rising volume of new rubber which is being consumed in the United States, leaving natural rubber with a relatively constant tonnage. As recently as 1948, natural rubber accounted for nearly 60% of all the new rubber used in the United States. Last year, however, natural rubber accounted for about 40 per cent of the total new rubber used in the United States, and some prophets see this percentage falling to 35% by 1960. A percentage of 25% has even been heard in some quarters. Faced with a sharp drop in relative use, natural may find itself hard pressed to maintain its tonnage rate as compounders use more and more synthetic.

What, basically, is behind the popularity of the synthetic?

Two things primarily: First, it is less expensive than the natural product and its price is stable; second, it is versatile. Over the years, the price of natural rubber has bounded up and down, as shown in Figure 4, notably in response to fluctuating supply and demand and to the comings and goings of international crises. In the last nine months of 1955, for example, it ranged from 29c to 52c a pound. It is, at this writing, down to about 37c. GR-S type synthetic rubber, however, sells at about a 23c level—and its price has always been relatively stable. This is of major importance to the manufacturers of rubber goods in the U.S.

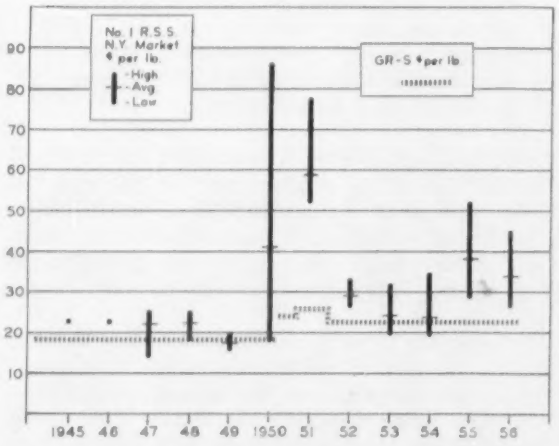


FIG. 4—Prices for natural and synthetic rubber—1945-1956.

What threat does the vastly expanding synthetic rubber industry hold for the great rubber producing areas of the Far East? Will synthetic "run natural out of the ball park" in a few years?

The most informed opinion on the subject is a flat "no". While world demand for rubber is rising rapidly, the capacity to produce synthetic rubber outside the U.S. is very small. The needs of rubber goods manufacturers in Europe and Asia will have to be met with natural rubber. In 1947, for example, all foreign countries (excluding Russia and her satellites) consumed 612,000 long tons of rubber. In 1956, they consumed approximately 1.36 million long tons. Indications are that by 1960, they may want nearly 1.8 million tons yearly.

During recent years, foreign consumption of new rubber has been rising at a rate of about 5% a year. During all these years, these same foreign countries have never consumed more than 200,000 tons of synthetic rubber in any given year, with far greater quantities of natural rubber consumed. This has been so for various reasons.

First, there has not been sufficient synthetic plant capacity abroad. France only recently decided to construct synthetic rubber plants. Great Britain's capacity, at the moment, is about 4,000 tons a year, although plans are afoot for the construction of several additional facilities. Production in Canada, biggest non-Communist producer after the U.S., topped 100,000 long tons for the first time in 1955.

Second, there has been a lethargy on the part of foreign rubber goods manufacturers to use synthetic rubber because of lack of technical know-how and general unfamiliarity with the material.

Third, serious foreign shortage of dollars has restricted the purchase of synthetic rubber from the U. S.

Fourth, many governments overseas place restrictive barriers in the way of importation of synthetic rubber.

Fifth, there are political considerations in which a program to import synthetic rubber by Great Britain, for example, is met with great opposition from Far Eastern natural rubber producers.

**Table I—Per Capita Consumption of New Rubber—1955**

| Country | lbs. |
|---|---|
| Argentina | 2.9 |
| Australia | 11.6 |
| Brazil | 1.6 |
| Canada | 11.5 |
| China | 0.3 |
| France | 8.2 |
| Germany (West) | 7.4 |
| India | 0.2 |
| Italy | 2.8 |
| Japan | 2.3 |
| Russia | 3.0 |
| South Africa | 5.0 |
| Spain | 1.0 |
| Sweden | 7.0 |
| United Kingdom | 11.7 |
| United States | 20.7 |
| Rest of World | 1.4 |
| World Average | 2.6 |

Source: Rubber Manufacturers Association.

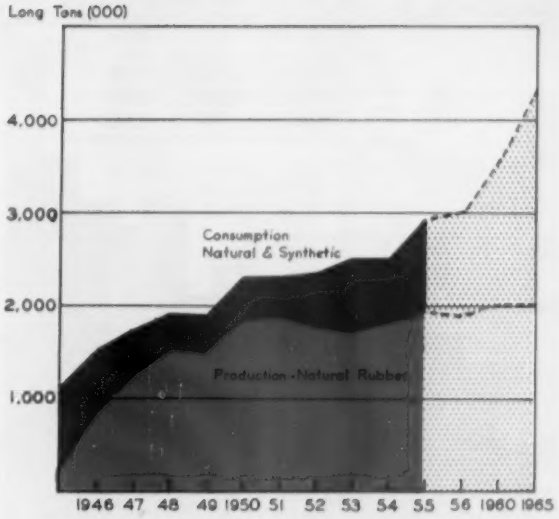


FIG. 5—World consumption of natural and synthetic rubber and world natural rubber production with estimates to 1965.

These factors tend to minimize the importance of synthetic rubber to the foreign rubber goods producer, much as he would like to avail himself of the opportunity of securing his raw materials at lower prices. It is concluded then, that even with the contemplated expansions in synthetic rubber producing facilities abroad, Europe will still depend primarily on natural rubber at least for the next five to ten years.

Significantly, few experts foresee any major expansion in natural rubber production in the near future, although efforts toward this end are being made through current plantings of high-yielding trees. It must be understood, however, that it takes a rubber tree seven years to mature so that any benefits which might accrue from this program cannot be immediately felt.

President Eisenhower's recent report on the nation's rubber requirements and resources said: "At most only a small over-all increase in production (of natural rubber) seems possible up to 1960." The report also said: "Broadly, the picture shows a certainty of increased world dependence on synthetic rubber for the next ten years."

Additional data with reference to the over-all new rubber picture and the synthetic-natural consumption ratio has come from W. J. Sears, vice-president of the Rubber Manufacturers Association. Mr. Sears observes that the rubber manufacturing industry of the world has grown tremendously since World War II and continues to display every potential for continued growth. Manufacturers of rubber goods outside the United States and Canada, however, still depend largely upon natural rubber to support increasing output.

Figure 5 shows the level of world consumption of natural and synthetic rubber for the past ten years and an estimate of the consumption trend over the next ten years. It will be seen in the 20-year span depicted in

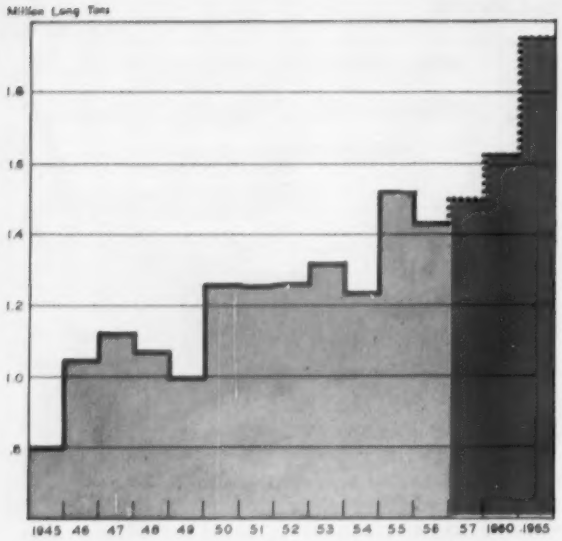


FIG. 6—U. S. new rubber consumption—1945-1956, with estimates to 1965.

the chart, that world rubber consumption may increase nearly three-fold in the years from 1946 to 1965.

Also shown on this chart is the actual and estimated levels of world natural rubber production. Significantly, there is no expectation of any substantial increase in natural rubber production in the years to come. Therefore, the world's rubber goods manufacturing industry must depend upon increasing supplies of synthetic rubber to support its growth. Although new synthetic rubber plants are being built abroad, it seems inevitable that the synthetic rubber industry in the U.S. will find growing export markets.

In the opinion of many in the trade, there is a dramatic potential for increased world rubber consumption. Table I shows new rubber consumption per capita in the principal countries of the world during 1955. This type of information provides a valuable measure of growth trends in the rubber industry. Rubber consumption per capita in the U.S. has trebled in the past 25 years and thus has grown at a much faster rate than the population. Increasing population in the U.S., and indeed throughout the world, supports the conclusion that the rubber industry has ever widening markets even if per capita consumption remains stable.

By all accounts, it would seem that the record of new rubber consumption is the best measurement of the industry's activities over the years. Figure 6 depicts actual U.S. new rubber consumption over a period from 1945 to date together with estimates through 1965. It is to be noted that in the period covered, the industry's consumption has steadily increased to a level many times greater than it was at the beginning of the period. The estimate for the next ten years alone suggests a further increase of 35 per cent.

Now that we have considered the growth of the rubber industry as a whole, what of the product segments?

Figure 7 shows the proportion of total rubber consumption going into the manufacture of tires and all other products. The chart demonstrates that over the ten-year span depicted, the "non-tire products" segment is accounting for an increasingly greater proportion of total consumption.

Table II shows the consumption of new rubber from 1945 to 1956, with estimates to 1975. It also points out the amount of new rubber which has gone into the manufacture of non-tire products in the years since 1945, together with estimates of the situation to 1975. The rising importance of this segment of the industry will readily be seen. Not only has there been an increase in consumption tonnages, there has also been a dramatic increase in dollar value of sales in this field. Between 1937 and 1954, for example, sales of non-tire products rose 500 per cent while the sales of tire products rose 330 per cent. In 1937, sales of non-tire products accounted for about 41 per cent of the total sales value and by 1954 this figure had risen to about 51 per cent of the total.

Figure 8 depicts the ratio that each product segment bears to the total amount of rubber used in 1955, the last year for which complete figures are available. Returning for a moment to Figure 7, it will be seen that approximately 38% of all the new rubber consumed

TABLE II—CONSUMPTION OF NEW RUBBER FROM 1945 to 1975*

| Year | Total U.S. New Rubber (in long tons) | Tires and Tubes (in long tons) | Other Than Tires and Tubes (in long tons) | Other Than Tires and Tubes (per cent) |
|---|---|---|---|---|
| 1945 | 799,009 | 583,009 | 216,000 | 27.0 |
| 1946 | 1,039,296 | 769,296 | 270,000 | 26.0 |
| 1947 | 1,122,327 | 819,327 | 303,000 | 27.0 |
| 1948 | 1,069,404 | 737,404 | 332,000 | 31.0 |
| 1949 | 989,903 | 647,903 | 342,000 | 34.5 |
| 1950 | 1,258,566 | 805,566 | 453,000 | 36.0 |
| 1951 | 1,212,912 | 800,912 | 412,000 | 34.0 |
| 1952 | 1,260,883 | 838,883 | 422,000 | 33.5 |
| 1953 | 1,338,309 | 856,309 | 482,000 | 36.0 |
| 1954 | 1,233,012 | 764,012 | 469,000 | 38.0 |
| 1955 | 1,529,699 | 940,699 | 589,000 | 38.5 |
| 1956 | 1,435,000 | 891,700 | 543,300 | 38.0 |
| 1957 | 1,500,000 | 930,000 | 570,000 | 38.0 |
| 1960 | 1,625,000 | 975,000 | 650,000 | 40.0 |
| 1965 | 1,950,000 | 1,131,000 | 819,000 | 42.0 |
| 1975 | 2,500,000 | 1,325,000 | 1,175,000 | 47.0 |

* Estimated from 1957-1975.

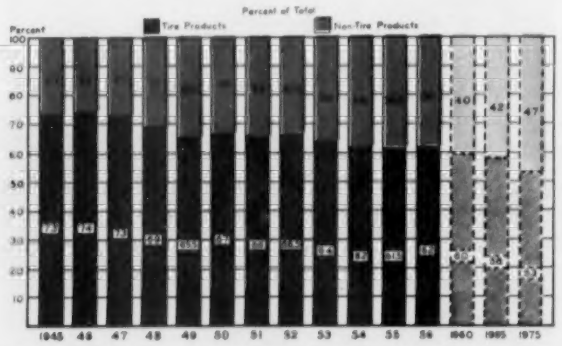


FIG. 7—Proportionate growth of non-tire products in new rubber consumption.

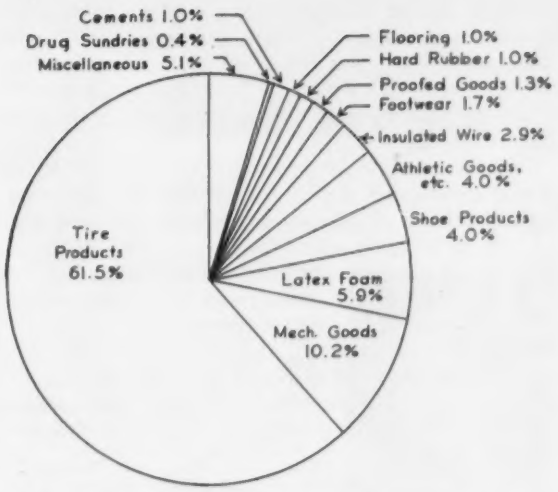


FIG. 8—How rubber is used—new rubber consumption in 1955.

in 1955, or about 589,000 long tons, went into the "non-tire products" category. Figure 8 shows that 10.2 per cent of all the new rubber consumed in the United States in 1955, or 154,900 long tons, went into mechanical goods; 5.9 per cent, or 90,700 long tons, into latex foam products; 4 per cent, or 61,800 long tons, into shoe products and the same amount into athletic goods (including toys, stationers' goods, and sponge rubber); 2.9 per cent, or 44,200 long tons, into insulated wire and cable; 1.7 per cent, or 25,900 long tons, into footwear; 1.3 per cent, or 20,600 long tons, into proofed goods; 1 per cent, or 15,300 long tons each into hard rubber products, flooring, and cements; 0.4 per cent, or 6,500 long tons, into drug sundries, and 5.1 per cent, or 76,700 long tons, into miscellaneous.

These figures are of more than academic interest in that it is within the non-tire segment of the field that there lies the greatest optimism for the industry. In the opinion of many, the mechanical goods field, for example, will make substantial progress in the next twenty-five years, and the same can be said for latex foam rubber. Even at the growth rate of 1 per cent a year which has been made during the past ten years for the entire segment, it will be seen that there is a tremendous potential in this area.

Since we have discussed the industry's growth possibility in terms of rubber consumption, let us outline the industry's growth in sales dollars. Attention should first be called to Table III which indicates net income after taxes of leading rubber companies from 1925 to 1955. A study of this table indicates an interesting pattern of development and provides some valuable background information. It will be seen that since 1950 leading tire and other rubber companies have been showing a return ranging between 12 and 16 per cent. During the war years, this figure jumped to 20 per cent at one point, and immediately before the war was closer to 9 per cent.

Let us turn for a moment to Figure 9 which shows sales of rubber products companies in millions of dollars. It is seen here that dollar sales have increased six-fold and show a particularly steep rise in the last five years. It should be borne in mind, however, that these

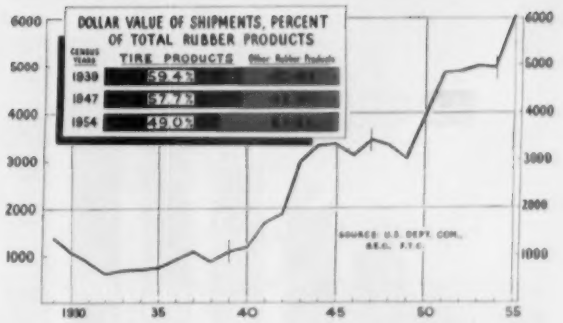


FIG. 9—Sales of rubber products in millions of dollars.

sales by rubber companies include the sales of many non-rubber products, such as chemicals, plastics, metal products, etc., reflecting the entry of many rubber companies into other fields. In the future, the sales line will continue to rise at least in relationship to the increase in rubber consumption. It may even rise at a faster rate, reflecting greater diversification and more profitable operations.

We have reviewed the growth trends of our industry in terms of rubber consumption and sales. With Figure 10 we take a look at the past record of rubber industry profits compared to the profits made by all other manufacturing industries. This chart reflects the cents profit per dollar of sales after taxes for the period 1929 through 1955. The source of these data is government reports.

The solid line represents the average for all other manufacturing corporations. The dotted line depicts the reported profits of rubber manufacturing firms.

For the 27 past years, as reviewed here, we find that during 21 of those years the average profit on sales of all other manufacturing corporations exceed the rubber industry profits. During two of the depression years, no profits were shown for any of the industry groups. It has been only in four of these 27 years that the rubber industry showed sales profits greater than the average. This occurred in 1942, 1946, 1954 and 1955.

> The industry's better comparative position in the past two years may reflect the results of increasing diversification. It may also reflect the rapid expansion of non-tire rubber product sales.

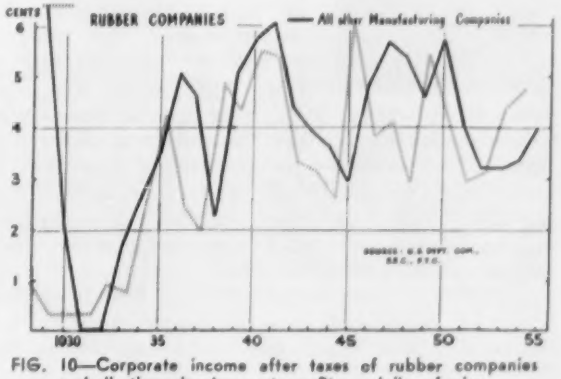


FIG. 10—Corporate income after taxes of rubber companies and all others showing cents profit per dollar of sales.

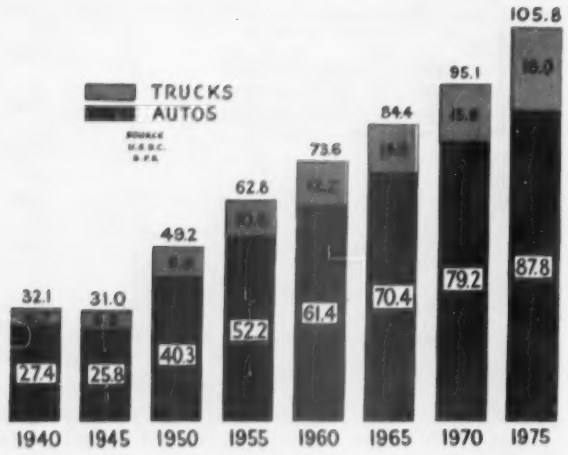


FIG. 11—U.S. auto and truck registrations, actual and estimated, 1940 to 1975, in millions.

Whatever the relationship which exists between the tire and non-tire segments of the rubber industry, the fact remains that the tire segment continues to be the major consumer of all the rubber used annually in the U.S. This one fact makes an investigation of the tire segment mandatory in our review.

The most informed sources estimate that tire sales in 1957 will be 6 per cent above 1956. It should be remembered, however, that tire sales in 1956 dropped 9 per cent from the 1955 levels, when accelerated automobile production brought a tremendous demand for tires. Many U.S. industry leaders have openly voiced their optimism and state that 1957 should easily be the second best year on record, with shipments approximating 111 million units. During 1955, the total topped 115 million and this was nearly double the 60 million turned out in pre-war 1940.

Annual motor vehicle registrations, as shown in Figure 11, are expected to reach 61.4 million cars by 1960, and 87.8 million by 1975. Some automobile industry experts have hopefully set their sights on producing 7 million automobiles in 1957 which would make the tire makers' shipment estimate of 111 million tires on the low side.

While the Suez crisis has lengthened supply lines from the Far East and boosted prices of natural rubber somewhat, no effect on tire sales volume has been noted. The upturn in natural rubber prices may contribute to higher truck tire prices. Major swings in tire volume from year to year are in passenger car types which usually account for about 80 per cent of all shipments.

The jolt of sharply reduced sales of original equipment passenger car tires in 1956 was cushioned by rising shipments of replacement tires. Passenger car replacement tire shipments at 52 million units were up 4 per cent from 1955. Estimates for replacement tires in 1957 range from a conservative 53 million units to 54 million or more. Original equipment tire sales in 1956 approximated 32 million units and it is expected that this figure will go to about a 36 million mark.

The steadily rising demand for tires from a swelling army of U.S. motorists gives tire companies the greatest degree of comfort in assessing the business outlook. Replacement sales of tires historically have run above original equipment volume. Even in 1955, the record automobile production year, replacement tire sales accounted for nearly five of every nine passenger car tires sold. As one tire maker put it, "replacement sales are the backbone of the tire business."

So there it is, the recent history of the rubber industry and a reckoning of what may be expected in the near future. It is, in all, an encouraging picture, encouraging not only in the plans which the industry has for the future, but for the faith which the industry exhibits.

It is obvious that in a review of this type there has not been direct reference to many materials or situations which have bearing on the "whole" picture. We have not discussed the vinyl resins or the potential impact of the urethane foams; nor have we discussed labor pension plans or the trend to .. shortened work week—all matters of relevance.

We have, however, attempted to present a consensus—a consensus involving the "educated guess" and the best reasoning of our industry's leaders. The individual statements which follow particularize the various segments of the rubber industry setting forth both the problems and the hopes of each. These statements have been expressly written for RUBBER AGE by the executives of many companies, large and small, by government figures and by persons from fields allied to the rubber industry.

We look to 1957 with "cautious optimism." We look to the years ahead with unbridled enthusiasm.

TABLE III—NET INCOME AFTER TAXES OF LEADING TIRE AND RUBBER MANUFACTURING CORPORATIONS

| Year | Number of Companies | Net Income | Net Assets January 1 | Per Cent Return |
|---|---|---|---|---|
| 1925 | 26 | $75,446,000 | $528,296,000 | 14.3 |
| 1926 | 28 | 30,034,000 | 579,287,000 | 5.2 |
| 1927 | 28 | 52,880,000 | 587,489,000 | 9.0 |
| 1928 | 23 | 4,073,000 | 595,608,000 | 0.7 |
| 1929 | 22 | 36,980,000 | 569,422,000 | 6.5 |
| 1930 | 22 | 20,566,000* | 661,489,000 | 3.1* |
| 1931 | 20 | 6,580,000* | 543,714,000 | 1.2* |
| 1932 | 25 | 14,578,000* | 518,772,000 | 2.8* |
| 1933 | 24 | 11,077,000 | 464,747,000 | 2.4 |
| 1934 | 24 | 11,145,000 | 458,645,000 | 2.4 |
| 1935 | 21 | 17,635,000 | 431,431,000 | 4.1 |
| 1936 | 22 | 42,083,000 | 428,425,000 | 9.8 |
| 1937 | 29 | 30,104,000 | 471,828,000 | 6.4 |
| 1938 | 29 | 24,641,000 | 480,935,000 | 5.1 |
| 1939 | 26 | 44,410,000 | 472,730,000 | 9.4 |
| 1940 | 21 | 42,978,000 | 477,002,000 | 9.0 |
| 1941 | 22 | 56,022,000 | 493,259,000 | 11.4 |
| 1942 | 25 | 53,496,000 | 521,875,000 | 10.3 |
| 1943 | 21 | 70,453,000 | 535,853,000 | 13.1 |
| 1944 | 22 | 68,996,000 | 586,642,000 | 11.8 |
| 1945 | 25 | 65,303,000 | 620,096,000 | 10.5 |
| 1946 | 27 | 136,759,000 | 663,616,000 | 20.6 |
| 1947 | 26 | 122,154,000 | 760,470,000 | 16.1 |
| 1948 | 25 | 112,207,000 | 803,207,000 | 14.0 |
| 1949 | 23 | 87,533,000 | 975,966,000 | 9.0 |
| 1950 | 26 | 160,070,000 | 1,019,370,000 | 15.7 |
| 1951 | 28 | 182,956,000 | 1,139,017,000 | 16.1 |
| 1952 | 26 | 165,059,000 | 1,234,211,000 | 13.4 |
| 1953 | 27 | 185,460,000 | 1,335,638,000 | 13.9 |
| 1954 | 27 | 171,552,000 | 1,430,249,000 | 12.0 |
| 1955 | 30 | 228,495,000 | 1,509,705,000 | 15.1 |

Source: The First National City Bank of New York tabulations of published shareholders' reports. * Deficit.

Figures 9, 10 and 11, courtesy of Rubber Manufacturers Association.

# Statements from the Industry

## *Sees Rising Industry Sales...*

H. E. HUMPHREYS, JR.

WE expect sales of the rubber industry will total six billion dollars in 1957 and will reach an annual rate of seven billion dollars by 1960. Passenger car and truck tire sales will total about 100 million units in 1957, compared with an estimated 98 million units for 1956. The increase in part reflects estimates by the auto industry that car production will be somewhere between 6½ and 7 million units next year. In addition, replacement passenger car tire sales will be 1½ per cent higher and should total about 52½ million units. Truck tire replacement sales will be the same or slightly lower than the 8½ million units we estimate for 1956.

An increase in automobile production will also boost the sale of the many other rubber industry products which go into new cars. Among these are foam rubber, plastic-coated and other fabrics for upholstery, a growing number of plastic items for interior trim and numerous rubbers products for seals, gaskets, hose and mountings. We shall also see the growing adoption of a new automotive rubber product, air springs. These will be used on a small scale in 1957 cars. By 1958, we believe they will be widely used.

The industry's sales of industrial rubber products always follow very closely the over-all activity of American industry. In view of forecasts that the Federal Reserve Board index of production will advance 4 or 5 points next year, such products as industrial hose, conveyor belts and power belts should enjoy a comparable increase.

Rubber consumption in 1957 will be about 1,500,000 long tons compared to 1,435,000 long tons in 1956 and 1,530,000 long tons in record-breaking 1955. Thus, the industry will have record-breaking sales with rubber consumption that is below the 1955 record.

A partial explanation of this situation is that the industry is following a trend toward consumption of less material classified as rubber per dollar of sales. The industry is beginning to consume significant amounts of newly discovered elastic materials (polyurethanes, polyvinyls, silicones and polyisobutylenes) which have not thus far been classified as rubber types in the statistics. In addition, the general price level for rubber products increased slightly in 1956 because of higher raw material and labor costs. These higher prices, which will be reflected throughout all of this year, will contribute to the expected increase in dollar sales.

United States Rubber Co. plans to invest a record of about 40 million dollars for expansion and modernization this year, compared with about 32 million last year and 35½ million in 1955. This year's investment will bring capital expenditures by the company over a 10 year period to 260 million dollars. Since 1948, we have invested more in research than in all the years before that, back to our incorporation in 1892. In the eight-year period we have brought out 24 new products or new product lines each of which has reached a sales level of a million dollars or more a year or is expected to in 1957. These new products contributed over 100 million dollars to our sales in 1956 and we estimate that figure will double by 1960.

Among next year's expansion projects are the completion of the company's research center in New Jersey, a new plastic plant in Baton Rouge, Louisiana, increased capacity for synthetic rubber at Naugatuck, Connecticut, a large warehouse for the Canadian subsidiary, a modernization of the British subsidiary and new Lastex yarn plants in England and France.

*H. E. Humphreys, Jr.*

*President, U. S. Rubber Co., New York, N. Y.*

## *Mechanical Goods Outlook Strong...*

R. E. MASTIN

ANALYSIS of the present conditions in the rubber industry can be best reviewed in my position in respect to the general mechanical rubber goods category. The La Favorite Rubber Manufacturing Company is engaged entirely in this field. Our relations to and transactions with all industry throughout the United States for the past several years have conclusively demonstrated that the steadily increasing expansion programs in the chemical, steel and allied industries, printing, textiles, paper and construction projects are the major contributors to strong business for the mechanical rubber products manufacturers.

Our business has been steadily growing, particularly in the chemical industries with demands of wide magnitude for the type of processing equipment which requires rubber and kindred insulation of metals from many substances and conditions of corrosion and erosion.

The past experience, together with the prospects ahead of us, causes only one conclusion to be drawn. We see it to be the anticipation of certain demands on the rubber industry due to continued strongly increasing capacities in many fields. Although rising costs continue to strike an alarming note, alert scrutiny of, and application to economies in production methods, judicious research and new material development, included with new product design, enable us to look forward to the year 1957 to have the largest volume and the most substantial increases of any time during our 60 years in the business.

*R. E. Mastin*

*President, La Favorite Rubber Manufacturing Co., Hawthorne, N. J.*

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## *Anticipates New Developments...*

B. P. NILLES

AS the larger percentage of our volume of business is connected directly with the graphic arts industry, we are probably in an individual category in the rubber field. As the trend in equipment in the graphic arts industry has changed in the past year, it is expected that more and more rubber will be consumed in 1957 than in previous years. With the growth of the graphic arts industry, it has brought many new developments, such as faster and speedier presses. Along with these new developments, it was necessary for us to keep abreast by the development of new rollers and blankets. Other kindred supply items have also improved on account of the faster presses. Constant research and development of new and improved products is the program for our laboratory. We are anticipating developments that will be of benefit to the industry and ourselves during 1957, and look forward to the continued growth in the graphic arts industry and with our sales organization, to maintain our position in the industry.

*B. P. Nilles*

*President, Rapid Roller Co., Chicago, Ill.*

## *Synthetic Picture Heartening...*

W. P. GEE

A TWENTY-TWO per cent expansion in synthetic rubber industry manufacturing facilities from 1,150,000 LT to 1,400,000 LT, was realized in 1956 and an equivalent percentage increase to 1,700,000 LT is planned for 1957. Butadiene producing plant expansions in 1957 will add 275,000 ST. This increase, less the 28,000 ST of alcohol derived materials removed from the market last year, will bring the potential output of butadiene in late 1957 to approximately 1,000,000 ST, a 38 per cent increase over 1956. Texas-U. S. Chemical Company has actively participated in this industry growth. Our jointly owned 200,000 annual ST capacity butadiene plant, the largest in the world, will be increased to 300,000 ST by mid-1958. Our S-type synthetic rubber capacity has been expanded to 126,000 LT, a 43 per cent increase since the acquisition of the plant, and further expansion to 137,000 LT will be made in 1957. It would thus appear that even with an anticipated export demand of close to 150,000 LT the industry will be able to provide a sufficient supply of synthetic rubber for the world's average 1957 needs. However, based on the historical pattern of erratic cyclic rubber demands, there may be some periods of tight supply, particularly in the first half of this year.

Contrasted with record consumption and peak production during the first year of private operation, concluded on April 30, 1956, the synthetic rubber industry in the remainder of 1956 found itself in a period of marked decrease in consumption and resultant cutbacks in production with competition intensified. This situation would indicate the need of an economic reappraisal of the industry under conditions of operating at rates below full plant capacity, higher commercial expenses and increasing unit production costs. Items that are causing rising producing costs include the increases in freight, labor and escalated utility and petroleum derived feedstock prices coupled with the maintenance of larger inventories and higher depreciation costs on new plant facilities. These factors far outweigh the effect of the projected price decrease for styrene in mid-1957.

In order that the synthetic rubber producers carry out the extensive research needed to insure a stable industry growth resulting from development of new polymers, better processes and products for its customers, it must realize an adequate return on investment, matching that experienced in other research-minded, growth firms characterized by the petroleum, chemical and plastics industries. Private research money already devoted to synthetic rubber development has multiplied many fold the rate of expenditures previously made under a Government controlled industry, but private research effort has only begun.

Our own company has during the past year announced the acquisition of a twenty-six acre research and development site in Parsippany, New Jersey. Here we intend to greatly increase our research activities in new laboratory facilities. Some of the customer benefits from research in 1956 have been the continuing improvement in polymer color and quality of the S-types, the introduction of new grades and advances in packaging.

Export demands plus domestic consumption resulted in the U. S. A.'s production of synthetic rubbers in 1956 exceeding 1,000,000 LT for the first time. Synthetic rubber's domestic usage should continue to rise over last year's 61 per cent of the total domestic consumption of new rubber. Synthetic rubber's share in 1957's forecast total rubber hydrocarbon consumption in the U. S. A. of 1,510,000 LT should be 950,000 LT vs. 880,000 LT for 1956. This anticipated eight per cent increase in synthetic rubber usage in the United States, and large investments being made in and planned for research and new production facilities provides a picture of an industry soundly building to take its place as a vital force in our country's economy.

*W. P. Gee*

*President, Texas-U. S. Chemical Co., New York, N. Y.*

## *Tougher Fight for Profits...*

ANDREW HALE

AS engineers we are not in an ideal position to make economic forecasts for 1957. However, through our contacts with the rubber industry, we note an almost unanimous opinion that the business volume will continue at a high level. Continuing regular increases in pay rates and an increasing resistance to price increases resulting from keen competition will put a squeeze on profits. This will stimulate increased expenditures of capital toward the end of improving production efficiency.

These factors will stimulate the mechanization of manufacturing processes to make the most efficient use of skilled labor which is becoming more and more expensive and in short supply. To accomplish this mechanization will require a greater use of competent engineers than has been the custom in the past. This will focus management's attention on the importance of internal engineering organizations, and the desirability of an engineering voice in management. In addition, it will lead to a more wide spread use of competent consulting organizations for attacking specific phases of the battle against increasing production costs. We predict that management will find it increasingly profitable to spend more time and money on competent engineering.

We predict an increasing demand for our services throughout 1957 and that management will find it increasingly profitable to spend more time and money on competent engineering assistance. It has already headed upward for concerns not only in this country but also abroad. As a matter of fact, we are looking for more good men to augment the excellent staff which was started but six years ago. Our policy has been to work in close harmony with management. This we believe to be a sure and reliable way to realize the best in profits.

*Andrew Hale*

*President, Hale and Kullgren, Inc., Akron, Ohio*

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## *1957 Textile Profits Good...*

T. SCOTT AVARY

PROSPECTS for textiles in the rubber industry at least for the first half of 1957, appear good and should be better than for the same period last year. This view is based, of course, upon the favorable outlook for the rubber industry itself. Among the major factors behind the situation are continuing large industrial expansion programs, federal and local government spending and an anticipated increase of approximately 10% in automotive production. Well-informed sources in the rubber industry predict that nearly 1,500,000 long tons of synthetic and natural rubber will be consumed in 1957, as compared with 1,435,000 last year; and, since textiles, too, are key "raw materials" for so many segments of the rubber industry, the mills producing these specialized fabrics expect that increased yardages will be required.

Of the major fabric-using divisions of the rubber industry, producers of mechanical goods apparently will benefit from the current progress of the Atomic Age. Atomic energy production seems to depend increasingly on coal productivity, and coal mining depends heavily on conveyor belts. Belt ducks—and newly engineered synthetic and combination-fiber textiles—will be at the core of this expanded activity. The principle of conveyor belts, too, offers promise in experimental and projected fields of long-distance hauling of materials, passenger-conveying

at shopping and travel centers, handling of airport luggage and department-store merchandise, and many other areas.

Anticipated tire production increases of 6% for the first half of 1957 indicate growing demand for tire fabrics, not only for passenger car, bus and truck service, but also for wheeled agricultural, construction and road-building equipment. Highway plans are a big factor. Both cotton and synthetic textiles are finding increased use as base fabrics for coating of natural and synthetic rubber as well as vinyl. A specially constructed fabric, for instance, of low-twist filament nylon yarns, coated with neoprene or vinyl, is serving in many applications ranging from protective tarpaulins and covers for marine, agricultural and industrial uses to carnival and theater tents, fumigation tents, fire salvage covers, irrigation dams, and many others. Special fabrics have also been engineered for rubber treatment to carry out new concepts in inflatable products: air-supported structures for housing, storage, or for protective purposes such as the well-known "radomes"; air-inflated "lifting bags" to serve as forms for rapidly-sprayed concrete structures; portable, collapsible field storage tanks for liquids. These are only a few examples of what has been accomplished by the teamwork of rubber-and-fabric, through the mutual efforts of technicians in both the rubber and textile industries. We are confident there will be more examples of such teamwork in the year to come.

*T. Scott Avery*

*President, Wellington Sears Co., New York, N. Y.*

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## *Rubber Chemicals Stable...*

J. S. CORRIGALL

AS 1956 ends, the rubber industry is busy. Nevertheless, the consumption this year of all types of rubber has decreased from the records made in 1955, both here and abroad. Rubber chemical sales and profits generally have shown a similar pattern. Reasons for this drop in rubber consumption are important to the rubber chemical industry in looking forward to prospects in 1957. For many reasons the rubber industry is not so dependent on the automotive industry as it was twenty years ago. However, it is a question as to what extent automotive prosperity or adversity affects the general economy. One fact for certain we know: if it is busy, we are too. Automobile sales dropped in 1956, due in part to carry-over of 1955 inventory. Automotive statisticians today are undoubtedly correct in predicting an improvement in sales for 1957, pointing, among other things, to rising incomes record employment and a return to the market of the record number of buyers of new cars in 1955. During this coming year of 1957, therefore, increased sales of all rubber products to the automotive industry may reasonably be expected, with a consequent improvement in sales of all chemicals used in these products. In fact, sales of certain rubber products to the automotive industry in December are already reaching 1956 levels.

Under way now, in 1957, and for the next several years, is a new, extensive, greatly-needed highway program which is being sponsored by both State and Federal Governments. The effect of this program on rubber consumption cannot be reduced to exact figures. Undoubtedly, it will have a very perceptible short and long range impact. Short range, as the construction of the highways progresses quantities of mechanical rubber goods and truck tires will be required. Long range, as the highways come into use, consumption of all automotive rubber products will increase appreciably. The magnitude and scope of the program are indicated by approved Federal and State expenditures for the next thirteen years totaling $31,000,000,000. During the 1956 Federal fiscal year, New York State alone has spent $70,000,000 and in 1957 will spend $120,000,000. We can see in the immediate future greatly expanded trucking operations and more passenger car travel, resulting in considerably increased usage of rubber and the chemicals that go with it.

While new, possibly revolutionary, rubber-like materials and processing techniques are already on the horizon, we at Vanderbilt do not foresee in 1957 any large scale rapid change in demands for rubber chemicals now being supplied. We think the rubber industry in 1957 will require chemicals of the same general class as in 1956 because the various types of rubber to be consumed will be the same. The chemical industry has found ways to make these chemicals better, with higher purity, in improved packages and in physical forms that make them easier to handle. For obvious reasons, the requirements of the rubber technologist for means to produce goods faster, better and with greater economy are becoming more urgent. These demands will intensify in 1957 and so far as laboratories and chemicals may assist him, the chemical industry will have to make still greater efforts in 1957.

In summary, we at Vanderbilt see improved general business for 1957 and an increase over 1956 in the over-all consumption of rubber and rubber chemicals although we do not expect radical changes in demand. We look forward to continued rapid expansion of the rubber industry and rubber chemical industry.

*J. S. Corrigall*

*Vice-President, R. T. Vanderbilt Co., Inc., New York, N. Y.*

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## *Scrap Market in Doldrums...*

SAMUEL A. TANNEY

THE scrap rubber market for the year 1956 was one of continuously diminishing returns. The beginning of the year saw mixed tires at $18.00 a ton, and gradually doing down to $15.00 a ton. The wonder of the age is that any scrap tire accumulators are willing to sell tires on this basis. Scrap tires have become a by-product of the used tire business, which is the only reason they are accumulated and shipped today. Should the used tire business become dormant, scrap tires will automatically have to command a more favorable price or disappear from the scene; as the economics of handling and shipping tires costs more than shippers realize for them.

There had been small sporadic buying of black and red tubes, with black tubes selling at around $.06 lb., and gradually increasing to $.06½ lb., as this grade has decreased in supply. The supply of red tubes has been small, as well as usage, with the price ranging from $.07½ to $.08 lb. Butyl tubes were around $.06¼ lb. at the beginning of the year, and their reclaim is used today primarily in the automotive industry—either going into new butyl tubes, automotive parts, or butyl liners for tubeless tires. When the second half of the year saw a slump in the automotive industry, the demand for butyl tube scrap dropped considerably, and the price receded to a low of $.03¾ lb., in the Akron area, from which they gradually rose to $.04¼ lb. at the present time.

This (1956) has been an exceedingly bad year for those people who deal exclusively in scrap rubber. Despite increased freight costs and increased labor costs, prices have, nevertheless, receded to unprofitable lows. At present, there are indications that prices should move higher with increased demand. Although reclaimers' inventories are comparatively comfortable at present reclaim production levels, any increase in reclaiming activities would automatically lower the months' supplies of scrap available in reclaimers' yards. Factories producing a finished product can add increased costs to their product; however, it is unfortunate that the dealers in scrap rubber have to absorb all wage and factory increases.

*Samuel A. Tanney*

*President, Scrap Rubber and Plastics Institute, N.A.W.M.D.; also Treasurer, Tanney-Costello, Inc., Akron, Ohio.*

## *Notes International Developments...*

E. G. HOLT

THE principal developments, internationally, in rubber raw materials during 1956 include a decline in United States consumption, a sharp increase in the imports of natural rubber into European iron curtain countries, and an increased trend toward the use of American synthetic rubbers in foreign free countries throughout the world in a year of less than normal increase in the consumption of new rubber in free Europe.

World production of natural rubber has been appreciably lower than in 1955, and an increasingly tight situation in natural rubber supplies was reflected in rising prices after May, which were accentuated after the Suez Canal was blocked by sunken vessels. The closing of Suez entails longer voyages for rubber from the Far East to Europe and the East Coast of North America, involving a larger tonnage of rubber afloat and a delay in arrivals. Stocks of natural rubber in consuming countries generally are not high; supplies of natural latex reached a high point in the United States during the second quarter of the year, but were reduced nearly 45 per cent from April to October.

In the United States, manufacturers of rubber products in the third quarter of 1956 used 39.3 per cent natural rubber versus 60.7 per cent synthetics compared with 40.7-59.3 per cent in the third quarter of 1955, only a minor reduction in the use of natural rubber. In Canada, natural rubber declined from 51.4 to 47.1 per cent of total consumption in the same period.

Supplies of synthetic rubber have been ample and prices steady; United States stocks of S-Type increased from 108,989 long tons in December, 1955, to 150,436 (preliminary) at the end of October, 1956, while stocks of butyl advanced from 10,500 to 25,182 long tons; United States exports of both S-Type and butyl were, however, lower in the third quarter than in the second quarter of 1956. American users of synthetic rubber report that in the period since disposal, there has been marked improvement in the uniformity of S-Type, and in color and other attributes rendering it more useful; in S-Type latex, improved particle size control has given it wider applications.

The year 1957 is expected to call for higher U. S. consumption of new rubber than in 1956, but probably less than 1,500,000 long tons. Consumption in free Europe seems likely to decline, retarded by gasoline rationing necessitated for some countries by the interruption in European supplies of oil from sources in the Middle East. The necessity of importing more oil from America until Persian Gulf oil is again amply available introduces another factor; it places an added strain on European dollar exchange resources, and although American finance will aid, exchange scarcity may lead to restriction or curtailment of European imports of synthetic rubber from North America.

Normal increase in new rubber consumption, and a further percentage advance in synthetic rubber usage, is anticipated in the rest of the free world. Russia, Communist China, and the iron curtain countries in Europe, may well import less natural rubber in 1957 than in 1956. If consumption of synthetic rubber in free Europe should increase from 17.5 per cent (1956) to 25 per cent (1957) of total new rubber, there would be a good chance that the world natural rubber position would rule easier in 1957 than in 1956. There is need, however, for adding to stocks of natural rubber in consuming countries of the free world, and at the moment, chances favor maintenance of world consumption of natural rubber at a rate equal to its remaining production.

Natural rubber production in 1957 should attain about the same tonnage as in 1956 although the Indonesian Government internal situation is now a factor of added uncertainty. If prices rule higher in 1957, production by small holders in Indonesia might increase. Prices in 1956, however, have been high enough to make operations profitable to practically all producers. Some Malayan and other areas planted seven years ago will be coming into production; some acreage tapped in 1956 has also been destroyed and replanted; these are off-setting factors.

This brief summary points to the probability that in 1957, our domestic rubber manufacturing industry will need to increase its percentage use of synthetic rubbers more than it has in 1955. Compounds for retreading tires are nearly all synthetic rubber, the insulated wire and cable industry finds synthetics suitable for over 90 per cent of its rubber requirements. Any large increase in use of synthetics would have to take place in tires, mechanical goods, rubber latices, or rubber footwear—in that order of magnitude. In these fields, success in increased use of synthetic rubbers will pay dividends both in the price of materials and in preparedness for any emergency which might occur.

*E. G. Holt*

*Assistant Director for Rubber, Chemical and Rubber Division, Business and Defense Services Administration, Department of Commerce, Washington, D. C.*

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## *Natural Rubber Here to Stay...*

H. C. BUGBEE

IF 1956 proved anything about natural rubber, it proved that it is here to stay. Throughout 1956 the average price of natural rubber has been higher than that of general purpose synthetic. Despite this differential, figures for the year show that natural just about maintained the 60-40% relationship with synthetic that obtained during 1955. Out of 1956's approximate over-all U. S. consumption of 1,455,000 tons, natural accounted for some 570,000 tons. In 1957, with some 1,500,000 tons over-all consumption expected, it is possible—if world conditions keep the price of natural well above synthetic—that the percentage of natural may go down a point or so . . . but the total tonnage of natural used should remain about the same.

For American industry, this consistently strong use of natural in the face of a really substantial price gap underscores an important point. In rubber, American and world industrial users will have the advantage of choice between two competing, but increasingly complementary commodities. As is always the case in strong and free competition, this will react to the benefit of the ultimate consumer in a wider range of rubber products, made of ever better raw materials at increasingly lower prices.

In no way is the foregoing intended to make a point for a wide price differential between natural and synthetic. Actually, if the natural rubber producer could control pricing, he would narrow the gap, because of subtantial price premium obviously inspires industrial customers to switch to the cheaper commodity whenever practicable. With a closer price margin, the percentage of natural used goes up. For example, in 1954 when the average price of natural's standard grade was within ½ cent of the synthetic price, natural's share of total U. S. consumption constituted 48%.

When the world situation and natural supply are such that the prices of natural and synthetic are more closely competitive, a number of influences work in behalf of natural. One of these is agricultural research. Such research is today stepping up the production of natural's factory—the rubber tree. Currently, high yielding trees are producing 1500-2000 lbs. per acre per year. As evidence of more substantial yields to come, there are some trees now actually producing at the rate of 3000 lbs. per acre per year. Replanting is constantly going on with the newest planting materials to bring down as far as possible production costs of natural rubber. Transferred to the market place, this will put natural in an increasingly stronger competitive position.

To further assure natural's share of the market, scientists in European and Asian research laboratories are hard at work to maintain the quality advantages natural now has and to add others. In the field of arctic research they have produced rubbers that maintain flexibility and strength at —167°F. For shoe soling

and similar uses, they have developed Cyclized rubber; for electrical switches, vacuum cleaner heads and similar moldings in all colors, there is now Heveaplus, a mixture of natural and synthetic resins.

In this country the Natural Rubber Bureau Research Laboratory in Rosslyn, Virginia, is carrying on extensive work in the field of rubber roads. European laboratories are also active in this field. Stretches of road using varying combinations of rubber and asphalt are now down in 42 states, Canada, Cuba, Europe, Asia, Australia, Africa, and New Zealand. Additional stretches in a number of states and other countries throughout the world are planned for 1957.

Laboratory research to date, just as in the case of the high producing trees, is symptomatic of advances to come. The natural rubber industry is today directing its attention to obtaining a sound share of the 4,000,000-ton world market American rubber manufacturing leaders are now forecasting for 1965. For its part in these stakes, natural is relying on the double impetus guaranteed by the industry's growing tree and laboratory research program—a quality product *plus* the ability to compete on price. Based on this combination, natural looks forward with assurance to maintaining its full share of the expanding rubber consumption all foresee for the decade to come.

*H. C. Baughee*

*President, Natural Rubber Bureau, Washington, D. C.*

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## *Carbon Black Outlook Excellent...*

THE carbon black industry is closely allied to the tire and mechanical goods segments of the rubber industry. Its fortunes tend to rise and fall with those of the latter. After the phenomenal boom in rubber use in 1955, rubber consumption seems to be slated for a plateau level before an over-all growth will reassert itself. By deduction, the same conclusion as to carbon black consumption would be reasonable.

When steel and other structural equipment again became readily available after World War II the carbon black industry on its own, that is without Government financing, launched on an expansion program which more than took care of demand. The still-existing sizable reserve of producing capacity continues to make for a highly competitive situation in the industry. The same "cause-and-effect" relationships appear probable for some time to come, if for no other reason than the continuing construction of plants outside the United States by both American manufacturers and local capital. The urge for such operations springs naturally from the widespread desire of the larger nations for self-sufficiency or from their currency exchange problems, or from both.

A stimulating matter of interest and concern to the carbon black industry is the unsettled state of carbon black quality requirements. The quality of tires and rubber mechanicals depends heavily on the carbon black which goes into their construction. The mentioned turbulence is generated initially in the never-ending demand on rubber manufacturers by the growing passenger car and truck-using population for tires which will, at one and the same time, ride more comfortably and last longer under heavier weights, rougher usage and higher speeds. A further production problem to the carbon black manufacturer arises from the constant requirement to tailor carbon blacks to fit new and improving synthetic rubbers in use or tentatively being experimented with by the rubber tire manufacturers.

Before World War II, over 85% of all carbon black was made by a relatively simple impingement process from natural gas. Grade and quality requirements were then few and easily satisfied. With the transition in rubber use from natural to synthetic which World War II made necessary, the carbon black industry had to resort to the more complicated procedure of cracking its feed stocks—much as petroleum is cracked by the refiner—in order to meet the greater variety of qualities needed. It devised furnace processes for the purpose.

The rising price of natural gas, engendered by the tremendous growth of pipe-line demand since World War II, finally required the carbon black industry to look more and more to the low cuts of refined petroleum for feed stocks to be cracked into carbon black in its furnaces. Today, 80% of all carbon black in the U.S.A., and virtually all carbon black in foreign countries, is made by furnace processes and preponderantly from low cuts of refined petroleum. Fortunately, developed furnace processes have the necessary flexibility to produce all the varieties which may be required by the rubber industry and ample supplies of such varieties and specifications as will finally become standards.

The carbon black industry finds its problems an exciting challenge and applies itself to their solution with vigor and skill. It realizes that its product is basic; it is the finest particle of earth's most versatile element. The product is unique; so little of it accomplishes so much for man's most widely used transport implement—the rubber-tired vehicle.

*Carl E. Kayser*

*President, Columbian Carbon Co., New York, N. Y.*

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## *Notes Inflation Danger...*

A. L. FREEDLANDER

IT is our firm conviction that the United States economy is basically sound and that nationally 1957 will be another good year. As a matter of fact, it could very well be a record year, exceeding this good year just closed by a few percent. All of the industries seem to point in that direction. This outlook applies especially to the rubber industry because rubber and allied products are now so indelibly woven into the nation's economy that this industry must be classified as both a basic industry and a growth one. The ever-widening areas of research and development that the industry in general and Dayton Rubber Company in particular is committed to can only mean bigger and brighter horizons for 1957 and future years.

At Dayton Rubber, the past decade has seen us broadening lines of products through bold and aggressive research and development, modern merchandising, stepping up production capacity for all products, with automation where feasible, and strengthening our position in those fields of distribution we claim as our markets. With that kind of background and dedicated to the same competitive philosophy for the future, we can only be optimistic for 1957.

It is heartening to note that on today's national economic front the U. S. has the largest productive capacity in our nation's history and the largest, most able work force. The scientific and technical skill of our people is greater than ever and constantly improving. Our standard of living—the possession and enjoyment of goods of all kinds—is at a new peak and still rising.

For the foreseeable period ahead, all signs seem to point to good economic sailing. The major impetus in 1957 should be the consumer whose insatiable demand for more and better quality products will probably push total U.S. output of goods and services to a new record high of $425 billion to $430 billion by next spring as compared to $410 billion to $412 billion for 1956. Other major sources of demand will also be important influencing factors. For example, an upward trend in government spending is already apparent.

We believe that the tight money situation will continue and, if anything, be still tighter, brought about by the Federal Reserve Board's fear of too great inflation. This will present some problems. Although I am very confident for the future, I must sound one note of caution for 1957 and that is the ever rising annual spiral of wages, material costs and other increasing costs which have been adding up to nothing less than ominous creeping inflation.

*A. L. Freedlander*

*President, Dayton Rubber Co., Dayton, Ohio*

## *Cites French Industry Problems...*

H. MAGNIN

THE interest that France has in rubber and in its industrial utilization goes back more than 200 years. This interest may be illustrated by reminding ourselves of the significance of the following dates: 1736—Charles Marie de la Condamine delivers the first scientific report on rubber to the Academy of Science in Paris; 1828—The first rubber footwear and rubberized fabric plant opens in Paris; 1863—Formation of the National Rubber Syndicate, an organization of French rubber manufacturers; 1895—The first automobile equipped with tires (a Peugeot driven by the Michelin brothers) travels from Bordeaux to Paris; 1931—Vehicles running on iron tracks are equipped with tires; 1938—Tires with steel cords are manufactured in France for the first time; 1951—Subway cars are equipped with rubber tires.

In 1938, the annual production of rubber goods in France reached 175,000 tons. In 1944, production fell to 25,000 tons as a result of the destruction of principal plants during the war and the general scarcity of rubber. By 1947, French production resumed its 1938 level and within a few years production was more than doubled, reaching 350,000 tons in 1955 and 385,000 tons in 1956.

This increase in French production not only reflects increases in French consumption, it also reflects increased exports to foreign countries and to the French colonies. In 1950, for example, France exported 10,000 tons of finished rubber products to foreign countries and 19,000 tons to the French colonies. By 1960, these figures had risen to 20,000 and 30,000 tons, respectively. To these figures must be added all the rubber which is on each automobile manufactured and exported from France as a unit. Keeping in mind these "indirect" exports, one can say that the French industry works one month a year for foreign countries and one day a week for French colonies.

One day a week for French colonies! This figure alone demonstrates the disastrous repercussion on France of the loss of its outlets in the colonies. It also permits a better understanding of the position of France in regard to all of the problems touching on the French colonies.

Twice, missions of productivity were sent to the United States. The reception which awaited them, the sympathy which was shown them and the instruction they received were appreciated by all French manufacturers. The French rubber industry is happy for this opportunity to again thank their American colleagues.

*H. Magnin*

*Secretary General, Syndicat des Importateurs Caouthchouc, Paris, France.*

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## *Sees Widening Horizons...*

STUART C. COVELL

FOR the British rubber industry, 1957 will mark the opening of a new era of widening horizons and growing opportunities. In the first place, manufacture of synthetic rubber in Great Britain has now begun. Three factories making styrene-butadiene copolymers, special-purpose rubbers, and small quantities of GR-S came into production in 1956. The construction of three more is announced, including a large plant near Southampton designed for an annual output of 50,000 tons of GR-S. This means that the British rubber industry, hitherto based largely on natural rubber, will be expanding still further into the synthetic field, but the development is not expected to have an adverse effect on the natural rubber producers, since the world demand for natural rubber seems likely to remain greater than the supply for many years to come.

Meanwhile, an increasing number of rubber manufacturers in Great Britain are turning to plastics as alternative materials. The trend was stimulated by the development of a satisfactory form of P.V.C. conveyor belting for use in coal mines, and by the decision of the National Coal Board to replace all underground belting by this fire-resistant type. Great Britain is the first country to insist on this safety measure in all coal mines, and by the middle of the year more than half the changeover had been effected. But plastics are also being used for an increasing range of products besides belting, and this broadening in the scope of the industry seems likely to proceed at an accelerated pace throughout 1957.

In 1956 some sections of the industry experienced a setback on the home market, due first to the Government's anti-inflationary measures, which bore heavily on the motor and furniture trades, and then to the Suez crisis and subsequent shortage of oil. In other sections, however, notably footwear, soling materials and household gloves, production was once more up on previous records. Moreover, there was a substantial increase in export figures for the whole industry, which was particularly gratifying, not only because it was achieved in the face of severe import restrictions imposed by several of our best customers, especially Australia and South Africa, but also because it represented a considerable gain in exports to the Continent of Europe. It was in view of this strength in the export position that the rubber industry has adopted a constructive attitude of mind towards the creation of a free trade area in Western Europe. From the threshold of 1957 it looks forward with confidence, recognizing that an increase in competition must be expected, but with high hopes of the wider opportunities that lie ahead.

*Stuart C. Covell*

*Director, Federation of British Rubber & Allied Manufacturers' Associations, London, England.*

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## *Foresees Higher Volume...*

E. J. THOMAS

THERE are two guideposts I can mention which will best give the picture for the rubber industry in 1957. The first is the number of tires produced. In 1940, the period immediately previous to World War II, our industry had reached a production of 60,000,000 tires. In 1956, we will have produced 104,000,000 tires. The estimate of the industry for 1957 is for the manufacture of 111,000,000 tires. This expected increase comes from a larger renewal tire market, but mainly from more tires for original equipment on new vehicles. These plans are based on a production in 1957 of 6,500,000 passenger cars and 1,200,000 trucks. Notable has been the continued switch to lower diameter and larger cross-section tires; the increased use of tubeless construction; the growth in very large tires for off-the-road hauling such as earth-moving; the increased use of synthetic rubbers; the shift almost completely from cotton to rayon, and now the rapidly increased use of nylon; and the development of safer and better tires.

The second guidepost is the amount of rubber consumed annually. This reflects not only tire production but the very fast-growing products such as industrial rubber goods, molded goods, foam and flooring. In the modern automobile, there is now almost as much rubber in other-than-tire products as there is in the tires. Rubber consumption in 1940 was 652,000 tons—100% natural rubber. In 1956, the industry used 1,435,000 tons, about 60% of this being synthetic rubber and only 40% natural. For 1957, we expect to consume 1,510,000 tons, with at least 62% of it synthetic and 38% natural.

Synthetic plant capacities in this country are being consider-

ably increased to where there will soon exist an annual capacity of all kinds of synthetic rubbers amounting to 1,700,000 tons, thus assuring the material for the growth of the industry. There will be plenty of rubber available, both synthetic and natural, and at more stable prices, with some of the old-time rubber inventory hazards being minimized. New synthetic rubbers, now in pilot plant stage, promise to be able to completely equal or better natural rubber for all usages.

The rubber industry, with its increased diversification, now including, in addition to tires and rubber products, the many other items such as chemicals, aircraft, electronics, metals and plastics, tends to be more stable than heretofore when more dependence was placed on tires alone. The new national highway program, as it develops, will give great impetus to increased vehicle registration and, consequently, rubber consumption. In all of our estimates, the strength of the first half of 1957 is a little more clear than the last half. The year for the rubber industry should be one of a little higher volume, plenty of capacity to take care of it, continued strong competitive selling, and a tough fight to maintain and improve profit margins.

*E. J. Thomas*

*President, Goodyear Tire & Rubber Co., Akron, Ohio.*

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## *Looks for Consumption Record...*

JOHN L. COLLYER

CONSUMPTION of new rubber continues to be the best measure of over-all progress in the rubber industry and usage of those materials in the United States in 1956 will be the second highest on record — approximately 1,440,000 long tons, or about 90,000 tons less than the all-time peak reached in 1955. The decline in new rubber consumption during 1956 was almost entirely due to lowered requirements by the automotive industry for tires and other rubber products for use on new vehicles. Replacement sales of almost all types of products manufactured by the rubber industry were higher in 1956 than in the previous year.

The outlook for 1957, based on what are believed to be attainable estimates of American motor vehicle production, indicates that the rubber industry in the United States will consume about 1,500,000 tons of new rubber in 1957 and could establish a new consumption record. At least 61 per cent of the total new rubber consumed in this country in 1956 was domestically-produced man-made rubbers, compared with 58.5 per cent in 1955. Usage of domestic rubber will undoubtedly show further gains in 1957. World consumption of rubbers last year has set a new record of nearly 3,000,000 tons, excluding consumption of man-made rubber in the Soviet bloc, about which little is known. World usage last year was more than double the consumption in 1946, ten years ago.

Production of tree rubber is not expected to exceed 1,900,000 tons in 1956, or in 1957, and there is little possibility of an increase before 1960, if then. The remainder of the world demand must be supplied by man-made rubbers. Constructive action by private industry, following the purchase of man-made rubber facilities from the United States government in 1955, and early in 1956, has made possible ample production capacities in this country. Our domestic capacities for producing man-made rubbers now total 1,355,000 tons while the rest of the free world can produce an additional 130,000 tons.

Further expansions now under way should increase this nation's capacity for production of man-made rubbers to 1,645,000 tons by the end of 1957, while the rest of the free world should step up to 160,000 tons. By the end of 1958, free world capacities will approximate 1,990,000 tons. The existing and planned capacities are ample to meet the probable demand through 1958 and perhaps through 1960.

We now know for the first time how to synthesize the natural rubber molecule from materials available in the United States and Goodrich-Gulf Chemicals, Inc., owned by the B. F. Goodrich Company and Gulf Oil Corporation, is now making this type of rubber—called 'Ameripol SN'—in a new pilot plant. Large scale production facilities could be constructed in 18 months, if required.

Barring a major emergency, 1957 is expected to be another year of business expansion. Automobile manufacturers expect domestic new car sales in 1957 to be from 500,000 to 700,000 units above the 1956 total. This together with the steady growth in replacement tire demand indicates a healthy increase in sales of rubber products during 1957.

*John L. Collyer*

*Chairman of the Board, B. F. Goodrich Co., Akron, Ohio.*

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## *Wire Sales Outlook Bright...*

J. R. MACDONALD

THE two most significant developments affecting the wire and cable industry in 1956 were the availability of adequate copper supplies beginning in the spring of that year following a two-year copper shortage and the increasing demand for the fabricated products of the industry. The increasing supplies of copper and the decrease in demand for copper from other than the wire and cable industry resulted in sufficient copper and a gradual reduction in the price of copper from 46c to 36c a pound. At the same time, the demands of the electric utility, communication and building industries (the decrease in the number of residential units constructed being more than offset by an approximate 20% increase in commercial and industrial construction) made 1956 undoubtedly the best year in the history of our industry.

As to 1957 we, in General Cable, feel that 1957 should be even better than the previous year. Copper should continue in plentiful supply, in view of the fact that there will be uninterrupted production of copper in the United States as a result of the three-year labor agreements signed by the copper companies in 1956. Moreover, the availability of aluminum, the use of which is increasing in the industry and which also has been in short supply, seems now to be assured. According to the information we have and the forecasts that we have seen as to the growth of industries basically served by the wire and cable industry, indications are that our industry should continue to expand in volume of sales in 1957. For example, it is estimated that construction will increase approximately 6%. The power utilities, according to present estimates, will spend 13% more in 1957 than in 1956 for generating equipment, distribution lines, etc., and the telephone industry will almost match this increase; its expenditures are expected to increase by approximately 11%. The entire electrical manufacturing industry will have an 8% to 10% increase. The tightness of the money supply may result in certain of these expenditures being deferred until 1958, but the growth in the demand for electricity and communications dictates these expenditures as soon as practicable. Certainly, in the light of the foregoing, it would be difficult not to view 1957 with confidence and assurance.

As to General Cable Corporation, our basic problem has been to install sufficient capacity to produce the volume of products sold by our expanded sales and distribution organization. The two new plants which came into operation within the past fourteen months are already insufficient in area and are being expanded. In addition, we have improved and expanded the productive capacity of our other plants. Our confidence in our future growth is shown by the fact that we are just starting construction of a new plant in Texas and we are projecting additional expansion in the not-too-distant future.

*J. R. MacDonald*

*Chairman of the Board, General Cable Corp., New York, N. Y.*

## *Latex Consumption Rising...*

ARTHUR NOLAN

WHILE accurate year end statistics are not available at this writing, it appears that 1956 U.S.A. consumption of all "rubber latices"; Hevea, "S", "N" and neoprene types; will not be as great as the banner year of 1955. This is not surprising but what is encouraging is, of course, that they did as well as they did.

Hevea's U.S.A. 1956 consumption will be on the order of 72,000 to 75,000 tons, down from 1956's 86,000 tons. Stocks at year end will be about the same, around 13,000 tons. Monthly consumption at the year's end was substantially up, approaching high consumption months of 1955.

During 1956, Hevea latex sold at distressed prices, a situation caused by purchases being scaled to 1955 consumption patterns which consumption did not materialize, resulting in a glut and overtaxed storage. At this writing, prices are firm at higher levels, although the industry generally feels prices of 40 to 45c will not permit fullest utilization of Hevea as alternates are lower priced. Future trend of supplies of Hevea are clouded by )a present price levels, and b) a lack of clarity on the part of users as to what their first half 1957 requirements are likely to be.

"S" Type Latex U.S.A. consumption in 1956 will probably be down slightly from 1955, perhaps 61,000 to 63,000 tons vs. 64,000 tons. Prices were practically unchanged during the year and no major changes are expected for 1957. Production facilities for high solids types are being expanded, not now being fully adequate to take care of peak demands. "N" and neoprene type latices were consumed in the U.S.A. at about the same rate as 1955, between 8,000 and 9,000 tons each. Production seems adequate to cope with foreseeable consumption demands and prices are stable.

If late 1956 consumption rates will carry on through 1957, then 1957 may become another 1955, or even larger. The latex industry, I believe, carries the strong conviction that their consumption curve is rising sharply, along with all rubber consumption, and there are still no indications of foam products markets diminishing.

*Arthur Nolan*

*Vice-President, Latex and Rubber, Inc., Baltimore, Md.*

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## *Notes Advances in Synthetic...*

H. S. FIRESTONE, JR.

THE rubber industry made the greatest strides in its history in the production and development of synthetic rubber during 1956 when, for the first time, it produced more than a million tons. Discovery of ways to produce new types of synthetic rubber with the desirable characteristics of natural rubber was one of the most significant developments of the year. Production of a synthetic with the qualities of natural rubber has been the goal of scientists for many years and facilities to produce it will be steadily expanded to make this country less dependent upon the supply of natural rubber from abroad.

The year 1956 was one of expansion, growth and vibrant business activity for rubber manufacturers. The industry, one of the dozen largest manufacturing industries in the United States, had its second greatest year in both sales and production. New products and increased demand for thousands of rubber items from rubber hoses to foam rubber mattresses kept sales volume for all rubber products at a high level. Rubber industry reports indicate gross sales of rubber products will reach $5,400,000,000. The 1956 sales figure represents a 10 year growth of 57.9 per cent of the 1947 sales volume of $3,420,000,000.

Consumption of rubber products in the United States in 1956 will amount to 1,435,000 tons. Synthetic rubber accounted for 60.9 per cent of rubber consumption in 1956, compared with 58.5 per cent during 1955 and 51.6 per cent during 1954. The high sales volume reflected the basic stability of the rubber industry. Tire sales held up despite the drop of nearly 25 per cent in production of new cars from almost 8,000,000 in 1955 to slightly less than 6,000,000 in 1956. Reports in early December indicated the rubber industry would sell between 101,000,000 and 102,000,000 tires for passenger cars, trucks and tractors during the year.

Some 62,000,000 or 61.5 per cent of the tires sold in 1956 were replacement—a market expected to become increasingly important as the number of cars on the streets and roads of America swells. There were 58,600,000 cars and trucks in use in the United States at the end of 1955 and at the end of 1956, that figure increased to 61,200,000. By the end of 1957, there will be about 64,000,000 cars and trucks in use which will stimulate the demand for replacement tires. During the calendar year of 1956, an estimated $180,000,000 was spent by the rubber industry in the United States alone for expansion.

*Harvey S. Firestone, Jr.*

*Chairman of the Board, Firestone Tire & Rubber Co., Akron, Ohio.*

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## *Reclaimers See Good Year...*

C. H. PETERSON

ALTHOUGH total national consumption of reclaimed rubber for the year 1956 did not quite meet expectations, the demand was firm and without excess fluctuation. This stability of the market is a healthy trend which is expected to carry on through the coming year. Consumption for 1956 is estimated to be 275,000 long tons, which is substantially lower than the 1955 consumption of 312,000 long tons. This lower consumption reflects the easing in demand for automotive products. The rubber reclaiming industry is time-honored and does not have to struggle for recognition. Its contributions, often unheralded, have figured prominently in our national economy since 1880. Self-satisfaction, however, is a dangerous attitude. The American system of free enterprise is ever competitive and progress is essential if we are to keep pace. The reclaim industry is well aware of its future responsibility to maintain and improve its position as a basic supplier of rubber hydrocarbon. To this end, an enlarged program for research, development, and service to the rubber goods manufacturers has been started.

That segment of our industry that has instituted research and development programming knows the rewards. Not only do new and better reclaims result, but growth of the individual industry is manifest. As an executive recently stated, "Superior growth is closely related to superior research, and the formula is: Show me a company that is spending three to five percent of its sales dollar on research, and I'll show you a company with roughly a ten percent rate of growth over the next five to ten years."

Through the years when natural rubber was the only source of new rubber, our industry bridged the shortage gaps and leveled off the peaks in price fluctuations with increased output of reclaimed rubber at stable prices. The remarkable growth of the synthetic rubber industry has already set a pattern for the future with a readily available supply of new rubber hydrocarbon and a degree of stability in price structure. Reclaimed rubber will continue to augment this pattern.

Already the automotive pace, set by the new car designs and increased sales, has indicated an upward swing in demand for rubber products in 1957. The reclaim industry is optimistic that this improvement will continue through 1957. Estimates for the consumption of reclaimed rubber in 1957 should place this year as one of the top years in the more than seventy-five years of our history.

*C. H. Peterson*

*President, Rubber Reclaimers Association, Inc.; also President, U. S. Rubber Reclaiming Co., Buffalo, N. Y.*

# THE CHEMISTRY OF REINFORCEMENT

## I—Some Reactions between Carbon Black and Simple Inorganic Molecules

By MERTON L. STUDEBAKER

*Rubber Chemicals Division, Phillips Chemical Co., Akron 8, Ohio*

IT is becoming increasingly apparent that a complex series of chemical phenomena accompany and form a real part of the reinforcement of elastomers by carbon black *(1)*. It is true that physical forces are involved in carbon black-elastomer interaction and that these are of tremendous importance in factory processing, since they are evidently responsible for most of the contribution of the carbon black to such properties as the plasticity *(2)* and resistance to shrinkage of carbon black-loaded unvulcanized stocks. Even in this case, however, certain chemical effects can be noticed *(3,4)*. These are particularly evident when the mixing and processing are conducted at high temperatures and/or in the presence of so-called "promoters" *(5,6,7)*. Physical forces are also manifest in vulcanized compounds, but present evidence indicates that here their contribution is of considerably smaller importance *(8)*.

Since no scientific theory is any better than the assumptions upon which it is based, theoretical treatment of reinforcement cannot rise above the level of speculation until adequate basic phenomenological studies have been made. Hence, until the nature of the reactions which take place during vulcanization are adequately understood, it will not be possible to present a comprehensive picture of the chemical aspects of reinforcement. However, it is believed that useful chemical information can be obtained at this time which will provide better background than now exists for serious studies in this field. An added incentive for such a study is the hope that the information obtained will be of some value in designing and using practical rubber compounds.

In this series of papers a serious effort will be made to study reinforcement by chemical procedures. As a start in this direction we will consider a limited investigation of the chemical reactivity of carbon blacks with certain simple inorganic compounds, i.e., hydrogen, ammonia, hydrogen sulfide and sulfur. Because of the definite relationship between the physical and chemical properties of carbon black and scorch, the second paper will deal with scorch in natural rubber stocks containing carbon black. Then, following in the footsteps of E. H. Farmer, his colleagues and others who have investigated the chemistry of vulcanization, a study will be made of certain model systems containing carbon black. These will include: (1) carbon black and sulfur, (2) carbon black, squalene and sulfur, (3) carbon black, squalene, sulfur and accelerators for vulcanization, and (4) carbon black, squalene and non-sulfur curing agents.

Note: This paper was presented before the Division of Rubber Chemistry, American Chemical Society, Atlantic City, N. J., September 20, 1956.

Our present plans include a limited study of rubber cements containing various compounding ingredients and, finally, the presentation of experimental results on natural rubber vulcanizates. Papers on these latter topics are currently under preparation.

### UNCATALYZED REACTION WITH HYDROGEN

It is well known that various types of carbon react with hydrogen at elevated temperatures to produce methane and that at high temperatures and pressures other saturated higher hydrocarbons and acetylene have been reported. Since this is a "text book" reaction, an extensive bibliography will not be presented, but certain recent work will be mentioned which is thought to be pertinent to our study.

Lewis and Metzner *(9)* in their study of activation of carbon by treatment with sulfur followed by hydrogen state: "At all runs at 825°C. and above, some reaction between the (sulfur containing) carbon itself and the hydrogen was evident. . . . The reaction between hydrogen and carbon resulted in the formation of some gaseous

### *Note from the Editor...*

**Until the nature of the reactions which take place during vulcanization are adequately understood, it will not be possible to present a comprehensive picture of the chemical aspects of reinforcement. Nevertheless, useful chemical information can be secured which will serve as background material for further studies in this field. Such information is presented in this series of papers by Mr. Studebaker which definitely show that carbon blacks are chemically reactive materials. Accordingly, they must be considered in any studies concerning the reinforcement of rubber. The first part of this series, published in this issue, covers some reactions between carbon black and simple inorganic molecules. The second, which will appear in our February, 1957, issue, discusses scorch in natural rubber stocks containing carbon black. The third, scheduled for our March, 1957, issue, is concerned with model systems containing carbon black and squalene. The data presented in the full series will prove of value in designing and using practical rubber compounds.**

TABLE I—THE ULTIMATE COMPOSITION OF CARBON BLACK TREATED WITH HYDROGEN AT VARIOUS TEMPERATURES

| Sample—Time—Temperature | % Change in Wt. on $H_2$ Treatment | % Change in Wt. over LiCl Soln. plus drying | % H | % C | % Ash | % S | % O By Diff.[2] |
|---|---|---|---|---|---|---|---|
| Spheron 9 Untreated | —— | —— | 0.71 | 95.76 | 0.00 | 0.03 | 3.50 |
| Spheron 9—1 Hr.—300°C. | —0.88[1] | —— | 0.68 | 96.40 | 0.00 | —— | 2.89 |
| Spheron 9—1 Hr.—400°C. | —1.19 | —— | 0.71 | 96.83 | 0.02 | —— | 2.41 |
| Spheron 9—1 Hr.—500°C. | —3.44 | —— | 0.81 | 98.38 | 0.00 | —— | 0.78 |
| Spheron 9—1 Hr.—600°C. | —4.21 | —— | 0.79 | 98.68 | 0.00 | —— | 0.50 |
| Spheron 9—4 Hrs.—600°C. | —4.27 | —— | 0.78 | 98.99 | 0.01 | —— | 0.19 |
| Spheron 9—1 Hr.—700°C. | —5.21 | —— | 0.70 | 99.04 | 0.00 | —— | 0.23 |
| Spheron 9—1 Hr.—800°C. | —6.53 | —— | 0.58 | 99.37 | 0.00 | —— | 0.02 |
| Spheron 9—1 Hr.—1000°C. | —7.11 | —— | 0.36 | 99.66 | 0.00 | —— | [—0.05] |
| Spheron 9—1 Hr.—1000°C. plus 24 Hrs. over Satd. Aq. LiCl Soln. @ R. T. | —7.27 | +0.23 | 0.31 | 99.49 | 0.03 | —— | 0.11 |
| Spheron 9—1 Hr.—1000°C. plus 30 days over Satd. Aq. LiCl Soln. @ R. T. | —6.97 | +0.12 | 0.37 | 99.47 | 0.03 | —— | 0.13 |
| Philblack E Untreated | —— | —— | 0.34 | 97.37 | 0.24 | 0.35[3] | 1.59 |
| Philblack E—1 Hr.—600°C. | —2.72 | —— | 0.41 | 98.93 | 0.34 | 0.22 | 0.10 |
| Philblack E—1 Hr.—1000°C. | —6.03 | —— | 0.26 | 99.53 | 0.23 | 0.01 | [—0.03] |

(1) This loss is in part and possibly entirely due to loss of carbon when removing the boat from the treating tube. The sample was charged and some particles were held on the silica tube above the boat. This was not observed with the other samples. (2) Sulfur content 0.03% on the untreated sample. This value was used in all calculations, but the determinations were not made. (3) There is uncertainty in the sulfur analyses of the original and 600°C. treated Philblack E samples. Another analysis of the untreated sample showed 0.40% sulfur.

hydrocarbons, as well as in the adsorption of some hydrogen by the solid, presumably on sites previously covered by sulfur."

The treatment of carbon with hydrogen to remove oxygen from the surface has been used by Smith, Pierce and Joel *(10)* and others, so that a "clean" carbon surface could be used in studying adsorption or reactivity. Smith et al state *(10)*: "This treatment appears to remove carbon-oxygen complexes. There is no indication that normal exposure to air at room temperature causes the carbon-oxygen surface complex to form again."

However, more recent work indicates formation of small amounts of such a surface complex during normal exposure to air *(11)*. Emmett *(12)* pointed out that treatment of carbons with hydrogen at elevated temperature increases the surface area, which is reasonable since carbon atoms are removed, mainly as methane, and the high temperature hydrogen treatment thus resembles other activation processes which increase the surface area by removing carbon atoms, e.g., treatment with steam, carbon dioxide, etc.

Loebenstein and Deitz *(13)* studied certain aspects of the treatment of bone char with hydrogen at 200° and 400°C. No ultimate analyses of the products were reported. However, the 400° treatment resulted in enhanced chemisorption of oxygen at 200°C. From their data, they concluded that during hydrogen treatment at 400° covalent C-H bonds were probably formed. The 400° treatment in hydrogen produced no detectable change in surface area of the sample. Hydrogen treatment at 200°C. did not change the chemisorption of oxygen.

An extensive study of carbon gasification by the Pittsburgh Consolidated Coal Company *(14)* includes data on the conversion of carbon to methane by hydrogen treatment. Treating temperatures of 1500° to 1700°F. were employed. No hydrocarbons other than methane were found.

In the work reported here it was desired to determine (1) the effectiveness of oxygen removal as a function of temperature, (2) the amount of hydrogen remaining on the carbon black after hydrogen treatment, (3) whether hydrogen could be added to carbon at elevated temperatures, and (4) to check the stability of carbons from which the oxygen had been removed during exposure to the atmosphere at room temperature.

## Procedure for Hydrogen Treatment

To accomplish these ends, a sample of Spheron 9 (EPC) carbon black was treated for one hour in a stream of hydrogen at various temperatures. A less extensive study was conducted on the Super Abrasion Furnace Black, Philblack E. Prior to the hydrogen treatment, the sample was dried in a platinum boat for one hour at 150°C. in a stream of dry nitrogen. The dried sample was then placed in a tube through which dry nitrogen was flowing. The temperature was brought up to the treating temperature, and the nitrogen displaced with hydrogen. The hydrogen was allowed to flow over the sample for the treating period (one hour in most cases), after which it was displaced with nitrogen, cooled to room temperature in the nitrogen atmosphere, weighed under nitrogen in a closed container, and immediately analyzed for carbon, hydrogen and ash. All flow rates were 10 ml./min. The samples weighed approximately 50 mg.

One sample was treated at 1000°C. and exposed to air at room temperature for 24 hours in a closed container (hygrator pistol) over saturated aqueous lithium chloride solution (relative humidity 10 to 13%). It was

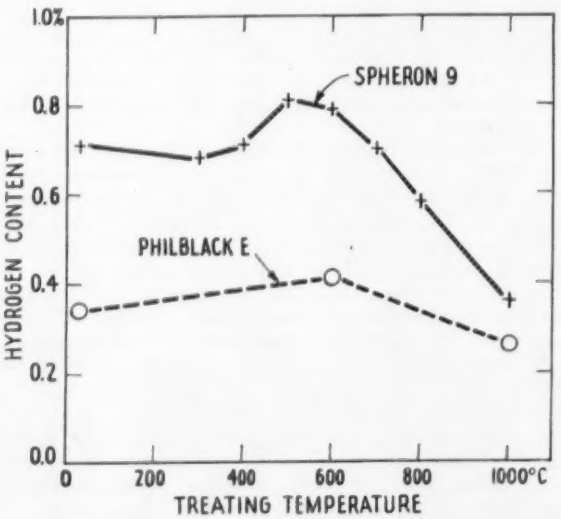


*FIG. 1—Change in hydrogen content with one hour treatments in hydrogen at various temperatures.*

then dried at 150°C. for one hour in dry nitrogen, weighed and analyzed for carbon, hydrogen and ash. Another sample was treated at 1000°C. and then allowed to stand in contact with air at room temperature over saturated aqueous lithium chloride solution for 30 days before drying and analysis. The analyses of all these samples are listed in Table I and plotted in Figures 1, 2 and 3.

The data in Table I and the figures show:

(1) That the 300° treatment reduced the hydrogen content of the Spheron 9 slightly. With increasing temperature, the hydrogen content increased to a maximum at 500°, fell off but slightly at 600°, but decreased more rapidly as the temperature was increased to the highest temperature of the tests (1000°). (Figure 1.)

(2) The oxygen content decreased with increasing temperature (Figure 2). At 1000°C. the oxygen was completely removed in one hour.

(3) Exposure to the air above a saturated aqueous solution of lithium chloride at room temperature resulted in a small but definite increase in oxygen which was not completely removed on drying in dry nitrogen for one hour at 150°C.

(4) The oxygen content of the furnace black (Philblack E) was apparently more readily removed at 600°C. than was the EPC black (Spheron 9).

(5) The hydrogen contents of the samples treated at 1000°C. in a hydrogen atmosphere were higher than the samples treated in nitrogen (Table II).

(6) Hydrogen also appears to be more effective in removing oxygen at this temperature. This indicates that the determination of the oxygen content of carbon black by the ter Meulen method (heating in hydrogen and collecting the water formed) might be more quantitative at reasonable heating time than the Untersaucher method (heating in nitrogen and converting any oxygen containing gases evolved to carbon monoxide).

In Figure 3 the *atoms of oxygen per 100 carbon atoms* are plotted against the *atoms of hydrogen per 100 carbon atoms*. This plot shows that in the region between 300° and 500°C., one atom of hydrogen was added to the sample for each oxygen atom removed. The significance of this is not known. However, other stoichiometric relationships of a similar nature have been observed, and it is hoped that they will provide clues to aid in investigations of the groups present on the carbon black surface *(15)*.

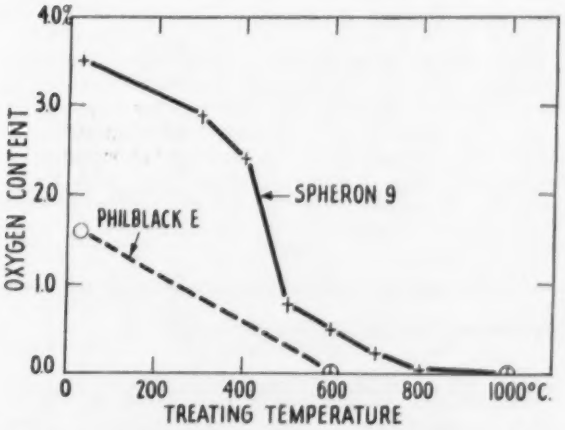


*FIG. 2—Change in oxygen content with one hour treatments in hydrogen at various temperatures.*

TABLE II—THE ULTIMATE COMPOSITION OF CARBON BLACK TREATED WITH NITROGEN AT 1000°C.

| Sample—Time—Temperature | % Change in Wt. on $N_2$ Treatment | % H | % C | % Ash | % S | % O |
|---|---|---|---|---|---|---|
| Spheron 9—1 Hr.—1000°C... | —5.77 | 0.29 | 99.75 | 0.00 | (0.03)* | [—0.07] |
| Philblack E—1 Hr.—1000°C. | —3.24 | 0.17 | 99.13 | 0.24 | 0.35 | 0.11 |

* Sulfur content of untreated sample of Spheron 9. It is assumed that this was not evolved on nitrogen treatment.

## Rubber Properties of Hydrogen-Treated Carbon Blacks

It has been reported *(16)* that the modulus of reinforced vulcanizates can be correlated with the hydrogen content, oxygen content and oil absorption (or Mooney viscosity) of the carbon blacks which they contain. Higher values of modulus are found with higher hydrogen contents of the carbon black. Oxygen on the carbon has the opposite effect. Accordingly, it is interesting to compare the rubber properties of a hydrogen-treated sample with those of the untreated sample.

Sufficient hydrogen-treated Spheron 9 (one hour at 600°C) was prepared for rubber tests. The following basic recipe was used:

| | |
|---|---|
| Natural rubber | 100.00 |
| Carbon black | 50.00 |
| Zinc Oxide | 5.00 |
| PBNA | 1.00 |
| Stearic acid | 3.00 |
| Paraflux | 5.00 |
| Sulfur | 2.50 |
| Santocure | 0.70 |

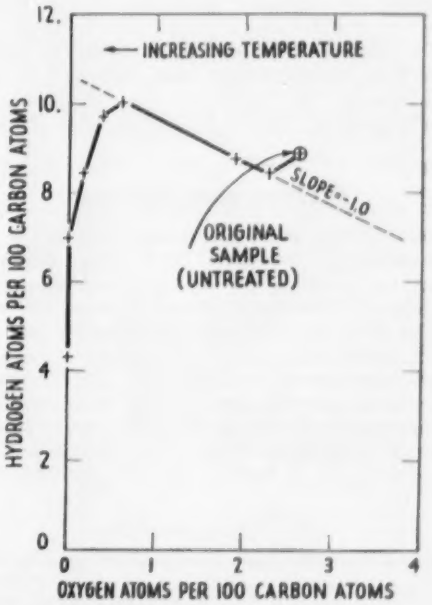


*FIG. 3—Atoms of oxygen versus atoms of hydrogen. (Note: Increasing the treating temperature in the region from 300° to 500°C. resulted in the addition of one hydrogen atom to the sample for each oxygen atom removed).*

TABLE III—SUMMARY OF RUBBER TESTS—HYDROGEN-TREATED SAMPLES

| Sample | Mooney Viscosity MS-1½ @ 212°F. | Time to Incorporate Bound Rubber (%) | Carbon Black (min.) | Min. Cure @ 280°F. | 300% Modulus (psi) | Tensile Strength (psi) | Elongation at Break (%) | Compression Set (%) | Shore Hardness | Abrasion Loss* | Goodrich Heat Build-up (°F.) | Resilience (%) | Electrical Resistivity (megohm-cm.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $H_2$ Treated Spheron 9 (1 Hour @ 600°C.) | 33.5 | 30.3 | 4 | 25 | 1470 | 4200 | 550 | 40.5 | — | — | 38.1 | 72.3 | — |
| | — | | – | 40 | 1570 | 4450 | 570 | 23.6 | 56.5 | 7.10 | 36.1 | 74.3 | 0.0547 |
| | — | | – | 60 | 1580 | 4430 | 580 | 14.6 | — | — | 38.8 | 70.9 | — |
| Untreated Spheron 9 | 34.5 | 40.0 | 5 | 25 | 925 | 4350 | 665 | 55.0 | — | — | 43.9 | 69.4 | — |
| | — | | – | 40 | 1175 | 4510 | 640 | 34.3 | 56.0 | 9.89 | 37.5 | 72.9 | 40.0 |
| | — | | – | 60 | 1325 | 4400 | 615 | 24.1 | — | — | 38.1 | 71.7 | — |

* Goodyear angle abrader, grams loss in 3,000 revolutions, 15° wheel angle, 33 lb. load.

A summary of the rubber data comparing the untreated Spheron 9 with the hydrogen-treated sample is presented in Table III. Hydrogen treatment produced striking changes in rubber properties. Most evident are the increased rate of cure, modulus, abrasion resistance and electrical conductivity. The changes in modulus, compression set and abrasion resistance are, of course, affected by the state of cure. Elongation was reduced as would be expected. The tensile strength was very slightly reduced. Changes in most other properties were small. It is interesting to note that hydrogen treatment markedly reduced bound rubber.

Tests on the uncompounded carbon black (Table IV) indicate an increase in surface area as determined by nitrogen adsorption. The increase in conductivity of the rubber stock containing the hydrogen-treated sample is a point of interest. The conductivity of the dry carbon black was also increased about 20-fold over the pressure range of 12 to 734 pounds per square inch exerted on the samples. As normally produced, carbon black contains hydrogen and, in general, the more hydrogen which a sample contains, the higher is its resistivity *(17)*. As reported here, the treatment with hydrogen at 600°C., which increased the hydrogen content slightly while drastically reducing the oxygen content, had the opposite effect.

## REACTION WITH AMMONIA

Mixter *(18)* in 1893 reported that lamp black reacted with ammonia at a "red heat," forming hydrocyanic acid, and that the resulting carbon contained approximately 3% nitrogen. The literature on this reaction was reviewed by Hill *(19)*. Wibaut *(20)* reported experiments in which carbon was heated in a stream of ammonia at constant temperature for three hours. The ammonia was then replaced with nitrogen for one hour at the treating temperature. Following this, the sample was cooled in a stream of nitrogen. Wibaut lists the data in Table V.

In three hours at 700°C., no nitrogen was fixed by Ceylon graphite or diamond powder. Charcoal activated by the method of Bartell and Miller gave a carbon with 2.5% nitrogen. Norit, an activated charcoal, fixed 2.6% nitrogen.

A nitrogenous carbon prepared from amorphous carbon and ammonia with nitrogen content of 1.2% was heated for five hours in a stream of nitrogen at 900°C. The nitrogen content of the remaining carbon was 0.55%. When heated with hydrogen, these nitrogenous carbons split off their nitrogen as ammonia. Wibaut concluded that, "It seems highly improbable that, in these products, the nitrogen should be present in a heterocyclic ring system." The inference from his work is that the nitrogen is probably present in the form of nitrile groups.

Hofmann and Ohlerich *(21)* reported on the reaction between ammonia and a sugar char which had been activated with a mixture of concentrated nitric and sulfuric acids for several hours at 80°C. Their studies were made in the temperature range of 110° to 410°C. The original activated sugar char contained a large amount of oxygen (16.6%). The analyses of Hofmann and Ohlerich's products are listed in Table VI. The ammonia was dried with sodium amide and passed over a thin layer of the carbon for 10 to 20 hours. Then the carbon was degassed for six hours under vacuum at the same temperature. From these analyses, we have calculated the ratio of oxygen atoms to nitrogen atoms. When this ratio is plotted against temperature, the interesting graph seen in Figure 4 is obtained.

### Experimental Procedure and Results

The work of Hofmann and Ohlerich was repeated with slight variations in the experimental procedure using the EPC black (Spheron 9). The treating time was 24 hours in most cases. After treatment with ammonia, the samples were evacuated at the treating temperature for five minutes with a water aspirator, then with an oil pump for 15 minutes. The samples were cooled to room

TABLE IV—TESTS ON THE UNCOMPOUNDED CARBON BLACKS

| Sample | $N_2$ Surface Area ($m.^2/g.$) | % H | % C | % Ash | % S | % O by Difference | pH Aqueous Slurry | Resistivity of Dry Carbon—Black at Various Pressures (ρ – cm.)— 12 psi | 177 psi | 407 psi | 734 psi |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $H_2$-Treated Spheron 9 | 123.7 | 0.75 | 98.54 | 0.01 | 0.03 | 0.67 | 9.3 | 10.0 | 2.74 | 1.62 | 1.24 |
| Untreated Spheron 9 | 114.8 | 0.71 | 95.76 | 0.00 | 0.03 | 3.50 | 3.7 | 264 | 80.0 | 39.6 | 25.9 |

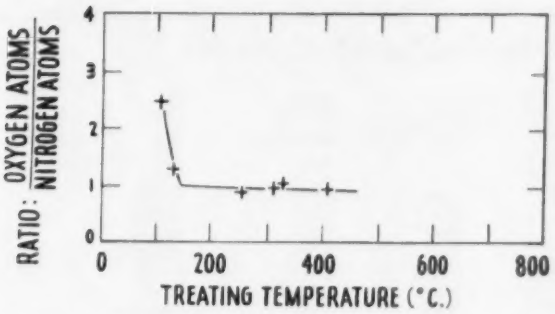


*FIG. 4—Ratio of oxygen atoms to nitrogen atoms following the data of Hofmann and Ohlerich.*

temperature while under vacuum and then swept with dry nitrogen for two hours. The data are tabulated in Table VII, and plotted in Figures 5, 6 and 7.

It is interesting to note that there was no reduction in hydrogen content until the treating temperature was raised to 600°C. In fact, the hydrogen content increased with treating temperature to a maximum at the 400° treatment.

The ratio of oxygen atoms to nitrogen atoms is plotted against treating temperature in Figure 5. Comparing Figure 4 with Figure 5 it is evident that the ratio of oxygen atoms to nitrogen atoms dropped to a value of 1.0 at a much lower temperature in Hofmann's work than was the case for ammonia-treated Spheron 9. Hofmann's data indicated that a large part of the oxygen on his carbon sample was in the form of carboxy and hydroxyl groups. This was not the case for our carbon black samples *(15)*.

In the work reported here, the amount of nitrogen in the samples increased with increasing treating temperature. For every two atoms of nitrogen introduced into the sample, one atom of oxygen was removed (Figure 7).

The significance of the changes in hydrogen content is not readily apparent. It is, however, interesting that the hydrogen content was not materially reduced until the treating temperature was raised to 600°C. When Philblack O was treated with ammonia at 300°C. for 24 hours, the ratio of oxygen atoms to nitrogen atoms was 0.93, which is considerably less than the value of 1.65 found for similarly treated Spheron 9. It is close to the value of 1.0 found by Hofmann and Ohlerich for their acid activated sugar char.

Hofmann and Ohlerich indicate that the lower temperature treatment (110°C.) may have produced an ammonium salt of an "acid surface oxide". As the temperature was increased, water split off, and the product had

TABLE V—SUGAR CARBON OUTGASSED IN VACUUM AT 1000°C.

(Rate of $NH_3$ Flow—10 Liters per Hour)

| Temperature (°C.) | Nitrogen Content of Resulting Carbon (%) | Carbon Converted into HCN (%) |
|---|---|---|
| 500 | 0.2 | — |
| 600 | 0.4 | — |
| 700 | 1.2 | 0.8 |
| 800 | 0.8 | 15.4 |
| 900 | 0.9 | 45.7 |

TABLE VI—ULTIMATE ANALYSES OF NITRIC ACID OXIDIZED CARBON BEFORE AND AFTER TREATMENT WITH AMMONIA AT VARIOUS TEMPERATURES

| | % C | % H | % N | % Ash | % O (by diff.) |
|---|---|---|---|---|---|
| Purified Carbon Oxidized with $HNO_3$ "Acid Surface Oxide" | 82.5 | 0.71 | 0.08 | 0.13 | 16.58 |
| Carbon with "Acid Surface Oxide" Treated with Ammonia at: | | | | | |
| 110°C. | 77.1 | 1.61 | 5.5 | 0.11 | 15.68 |
| 135 | 84.1 | 2.0 | 5.6 | 0.17 | 8.13 |
| 255 | 83.6 | 1.25 | 7.5 | 0.16 | 7.49 |
| 315 | 82.5 | 1.31 | 7.5 | 0.17 | 8.52 |
| 330 | 79.9 | 1.19 | 8.7 | 0.18 | 10.2 |
| 410 | 77.3 | 1.62 | 10.0 | 0.17 | 10.9 |

properties which indicated the possibility of the formation of an acid amide. The analyses plotted in Figure 4 were certainly in accord with this interpretation; but, as Hofmann and Ohlerich state, "sufficient evidence is not at hand to definitely establish the nature of the nitrogen-containing groups". Our ultimate analyses of the products obtained from the reaction of Spheron 9 with ammonia cannot be interpreted very satisfactorily in this manner. This is believed to be related to the nature of the oxygen-containing groups on the surface.

Preliminary work has been conducted in an effort to establish the nature of the nitrogen-containing products obtained by reacting Spheron 9 with ammonia at 600°C. These attempts have been rather unsuccessful. The experiments are detailed as follows:

(1) *Hydrolysis:* (a) A sample was heated in a Kjeldahl apparatus with strong NaOH. The ammonia given off was equivalent to 0.1% or less of nitrogen.

(b) A sample was heated on the water bath with 80% $H_2SO_4$ for one hour. Ammonia equivalent to 0.18% nitrogen was found by Kjeldahl distillation.

(c) A sample was treated for one hour at 150°C. in a sealed tube with concentrated HCl. Ammonia equivalent to 0.06% nitrogen was found on Kjeldahl distillation.

(d) A sample was heated in a sealed tube at 300°C. for 12 hours with concentrated HCl. Ammonia equivalent to 0.62% nitrogen was found on Kjeldahl distillation.

(e) Another sample heated in a sealed tube at 300°C. for 12 hours with concentrated HCl (as in d) was centrifuged, the HCl poured off, and the black dried in vacuo over KOH. This sample was analyzed for carbon, hydrogen, ash and chlorine. The loss on drying at 150°C. in dry nitrogen was 2.44%; hydrogen, 0.70%; carbon 92.12%; ash, 0.31%; chlorine, 2.18%. The atomic ratios of chlorine

$$\frac{2.18}{35.46} = 052$$

and nitrogen

$$\frac{0.62}{14.01} = 0.044$$

(see d above) are in the same order of magnitude, assuming no loss of nitrogen on hydrolysis. Possibly, hydrolysis in a sealed tube with HCl at 300°C. continued for a few days would yield a more complete hydrolysis.

TABLE VII—ULTIMATE ANALYSES OF AMMONIA-TREATED SAMPLES

| Sample | % Drying Loss | % H | % C | % Ash | % N[2] | % S[3] | % O (by diff.) |
|---|---|---|---|---|---|---|---|
| Untreated Spheron 9 | 1.29 | 0.64 | 95.90 | 0.00 | 0.00 Sp. D. | 0.00 | 3.46 |
| Spheron 9 Treated with $NH_3$ at: | | | | | | | |
| 100°C.—24 hrs. | 0.64 | 0.74 | 95.52 | 0.00 | 0.57K | (0.00) | 3.17 |
| 200°C.—24 hrs. | 0.93 | 0.66 | 95.25 | 0.10 | 1.26D | (0.00) | 2.73 |
| 300°C.—24 hrs. | 0.79 | 0.71 | 95.13 | 0.00 | 1.48K | (0.00) | 2.68 |
| 400°C.—24 hrs. | 0.92 | 0.77 | 95.05 | 0.02 | 2.11K | (0.00) | 2.05 |
| 500°C.—24 hrs. | {0.67<br>{0.97 | 0.72<br>0.70 | 96.61<br>96.38 | 0.02<br>0.05 | 1.94K<br>1.87K | (0.00)<br>(0.00) | 0.71<br>1.00 |
| 600°C.—24 hrs. | ... | 0.59 | 94.94 | 0.00 | 3.57K | (0.00) | 0.77 |
| 100°C.— 8 hrs. | 1.11 | 0.72 | 95.58 | 0.04 | 0.48D | 0.01 | 3.17 |
| 300°C.— 1 hrs. | 1.51 | 0.69 | 94.82 | 0.00 | 0.70D | (0.00) | 3.79 |
| 300°C.— 8 hrs. | 0.92 | 0.71 | 95.19 | 0.00 | 1.41D | 0.03 | 2.72 |
| Untreated Philblack O | 0.12 | 0.31 | 98.52 | 0.22 | 0.00 Sp. D. | 0.33 | 0.62 |
| Philblack O Treated with $NH_3$–24 hrs. @ 300°C. | 0.15 | 0.31 | 98.16 | 0.22 | 0.49K | 0.30 | 0.52 |

(1) Dried one hour at 150°C. in a stream of dry nitrogen (10 ml./min.). (2) K—sealed tube Kjeldahl determinations, believed to be most accurate. D—Dumas determinations. Sp. D.— Special Dumas in which the entire sample was completely combusted with carbon dioxide without catalyst. (3) Sulfur analyses in parenthesis were not run on these samples but were used in the caluclations of oxygen by difference. Repeated analyses of the starting material have fallen between 0.00 and 0.03% sulfur.

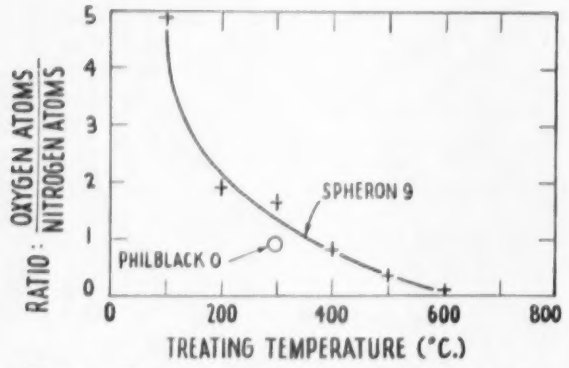


*FIG. 5—Ratio of oxygen atoms to nitrogen atoms —ammonia-treated Spheron 9.*

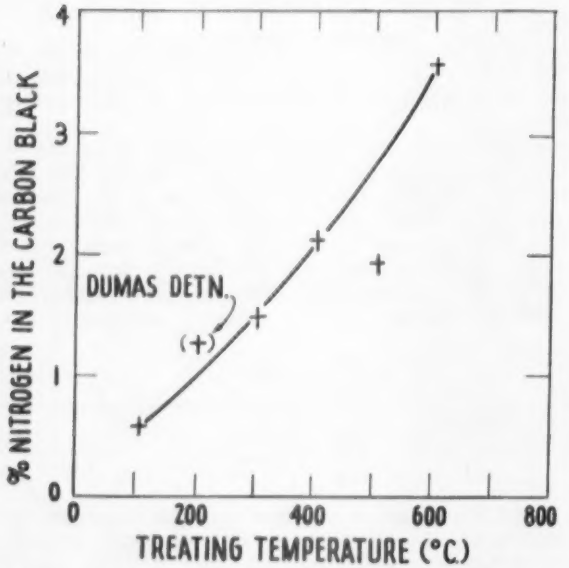


*FIG. 6—Nitrogen content of ammonia-treated Spheron 9 at various temperatures.*

(2) *Hydrogenation:* A sample was hydrogenated in acetic acid in the presence of $PtO_2$. The uptake was 0.16% in 18 hours. (About ten times this amount would be needed to completely hydrogenate the amount of nitrile represented by the nitrogen content of the sample).

(3) *Acetylation:* A sample was heated on the water bath for six hours with acetic anhydride. On titration, it was found that no acetic anhydride had been consumed.

(4) *Primary Amino (or Amide) Nitrogen:* A sample was treated with nitrous acid in the Van Slyke apparatus. After four hours, only 0.1% nitrogen was found. There was no increase in the last hour. (A sample of Spheron 9 ammonia treated at 400°C. for 24 hours gave 0.4% nitrogen in the same time indicating some $NH_2$—probably amide, from the rate.)

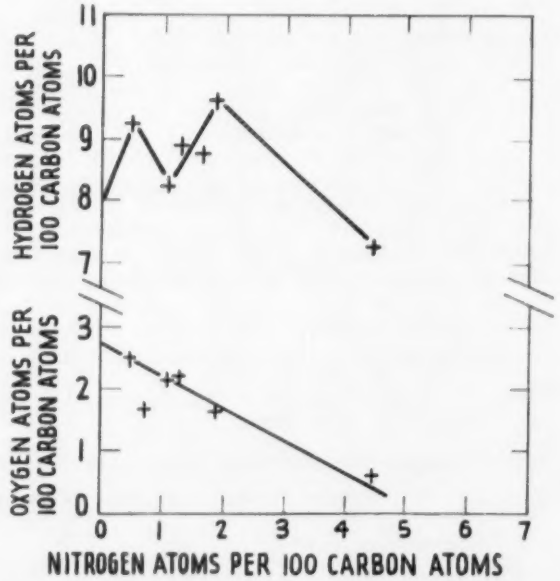


*FIG. 7—Ratio of hydrogen atoms and oxygen atoms to nitrogen atoms based on present work. (Note: For every two atoms of nitrogen introduced into the sample, one atom of oxygen was removed).*

TABLE VIII—SUMMARY OF RUBBER TESTS—AMMONIA-TREATED SAMPLES

| Sample | Mooney Viscosity MS-1½ @ 212°F. | Min. Cure @ 280°F. | Compression Set (%) | 300% Modulus (psi) | Tensile Strength (psi) | Elongation at Break (%) | Shore Hardness | Abrasion Loss (g.) | Goodrich Heat Build-up (°F.) | Resilience (%) | Electrical Resistivity (megohm-cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $NH_3$-Treated Spheron 9.... | 38.5 | 25 | 46.9 | 1140 | 4400 | 645 | 58.0 | ... | 37.8 | 73.4 | ... |
| (24 Hrs. @ 400°C.) | | 40* | 34.8 | 1600 | 4230 | 560 | 63.0 | 8.58 | 36.5 | 73.5 | 3.2 |
| | | 60 | 22.7 | 1430 | 4380 | 590 | 64.0 | ... | 36.5 | 73.8 | ... |
| | | 90 | 14.2 | 1460 | 4280 | 580 | 65.0 | ... | 38.1 | 70.4 | ... |
| $NH_3$-Treated Spheron 9.... | 37.0 | 25 | 46.7 | 1240 | 4730 | 640 | 60.0 | ... | 37.5 | 73.9 | ... |
| (24 Hrs. @ 600°C.) | | 40* | 34.7 | 1460 | 4160 | 560 | 64.5 | 8.31 | 36.8 | 73.5 | 0.084 |
| | | 60 | 23.2 | 1330 | 4520 | 600 | 63.5 | ... | 37.1 | 72.5 | ... |
| | | 90 | 15.1 | 1340 | 4340 | 600 | 62.5 | ... | 38.1 | 70.9 | ... |
| Spheron 9 ..... | 43.5 | 25 | 64.1 | 750 | 3880 | 685 | 51.0 | ... | 50.3 | 69.5 | ... |
| (Untreated Control) | | 40* | 44.8 | 1070 | 4410 | 650 | 58.5 | 14.17 | 38.1 | 72.4 | 50.6 |
| | | 60 | 32.1 | 1300 | 4720 | 615 | 61.0 | ... | 37.8 | 72.4 | ... |
| | | 90 | 21.5 | 1370 | 4550 | 610 | 63.0 | ... | 38.5 | 70.4 | ... |

* The thickness of test slabs for 40-minute cures were 0.080-inch. All others were 0.030-inch.

It would seem from these experiments that the nitrogen in the 600° treated sample may be present in a nitrile form which is extremely stable to hydrolysis.

## Rubber Properties of Ammonia-Treated Carbon Black

Samples of Spheron 9 treated with ammonia for 24 hours at 400° and 600°C. were tested in the following rubber compound:

| | |
|---|---|
| No. 1 Smoked Sheets ..... | 100.0 |
| Carbon Black ..... | 50.0 |
| Zinc Oxide ..... | 5.0 |
| PBNA ..... | 1.0 |
| Stearic Acid ..... | 3.0 |
| Paraflux ..... | 5.0 |
| Sulfur ..... | 2.5 |
| Santocure ..... | 0.5 |

The quantity of the samples was not sufficient to make a preliminary evaluation of accelerator requirements. Hence, the Santocure level was chosen to be intermediate between the level used for very fast curing and slow curing blacks. This resulted in slow cures for the untreated sample.

The data are summarized in Table VIII. In general, the treatment with ammonia produces results similar to those produced by the hydrogen treatment. Rate of cure, modulus and abrasion resistance were increased. Tensile strength, elongation, electrical resistivity and compression set values were reduced. The effects noted seem to be largely due to changes in the state of cure.

## REACTION(S) WITH HYDROGEN SULFIDE

Highly carbonaceous materials (charcoal, coke, etc.) react with hydrogen sulfide at high temperatures to produce carbon disulfide. Excellent studies of this reaction have recently been published by Owen, Sykes Thomas and White *(22, 23, 24)*. However, no information seems to be available on the chemical interaction between carbon black and hydrogen sulfide at the temperatures normally used in vulcanizing rubber.

The importance of hydrogen sulfide in determining the course of the reactions which take place during vulcanization has been indicated repeatedly in the literature *(25-29)*. It is, then, of some importance to determine whether carbon black reacts with hydrogen sulfide at, say, 150°C., since this could alter the hydrogen sulfide level present during vulcanization. Furthermore, a reaction between carbon black and hydrogen sulfide might so change the chemical nature of the carbon black surface that its activity as a reinforcing agent would be affected.

## Experimental Procedure

The sample was placed in a glass or silica tube held in a vertical position and swept with dry nitrogen for 20 minutes at room temperature. The sweeping was continued for another hour while the sample was being heated to and held at the treating temperature. (A temperature of 150°C. was reached within five minutes.) The nitrogen was then displaced with hydrogen sulfide. After the sample had been treated for a definite period of time, the hydrogen sulfide was replaced with nitrogen and the tube was cooled to room temperature in the nitrogen stream. A schematic sketch of the apparatus is shown in Figure 8. (The furnace is not shown.)

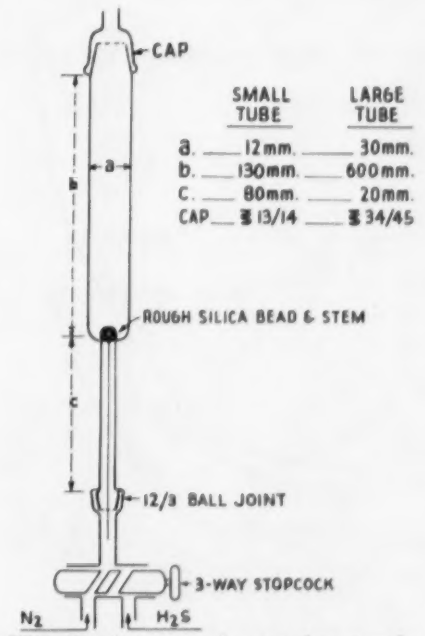


*FIG. 8—Apparatus for treating samples with hydrogen sulfide.*

TABLE IX—ULTIMATE COMPOSITION OF CARBON BLACK SAMPLES TREATED WITH HYDROGEN SULFIDE FOR ONE HOUR AT VARIOUS TEMPERATURES

| Sample | Treating Temp. | % H | % C | % Ash | % S | % O (By Diff.) | Δ % S* |
|---|---|---|---|---|---|---|---|
| Philblack O | Untreated | 0.31 | 98.52 | 0.22 | 0.33 | 0.62 | ... |
| | 150°C. | 0.37 | 98.40 | 0.26 | 0.48 | 0.55 | 0.15 |
| | 300°C. | 0.35 | 98.48 | 0.24 | 0.42 | 0.51 | 0.09 |
| | 450°C. | 0.34 | 98.53 | 0.25 | 0.68 SD | 0.20 | 0.35 |
| | 600°C. | 0.28 | 97.68 | 0.25 | 1.86 | ... | 1.53 |
| Philblack E | Untreated | 0.34 | 96.86 | 0.27 | 0.40 | 2.16 | ... |
| | 150°C. | 0.35 | 96.66 | 0.27 | 0.75 | 1.97 | 0.35 |
| | 300°C. | 0.33 | 97.12 | 0.25 | 0.96 | 1.34 | 0.56 |
| | 300 recheck | ... | .... | ... | 0.94 | ... | 0.54 |
| | 600°C. | 0.35 | 97.12 | 0.19 | 0.31? SD | 2.03? | ? |
| | 600 recheck | 0.33 | 96.94 | 0.26 | 1.79 | 0.68 | 1.39 |
| Spheron 9 | Untreated | 0.71 | 95.76 | 0.00 | 0.03 | 3.50 | ... |
| | 30°C. | 0.68 | 95.14 | 0.02 | 0.53 | 3.63 | 0.50 |
| | 75°C. | 0.70 | 94.79 | 0.01 | 1.20 | 3.30 | 1.17 |
| | 150°C. | 0.72 | 94.90 | 0.00 | 0.86 | 3.52 | 0.83 |
| | 300°C. | 0.72 | 95.57 | 0.01 | 0.75 SD | 2.95 | 0.72 |
| | 450°C. | 0.71 | 96.06 | 0.00 | 1.37 | 1.86 | 1.34 |
| | 600°C. | 0.66 | 96.23 | 0.01 | 2.48 SD | 0.62 | 2.45 |
| | 670°C. | 0.44 | 95.03 | 0.00 | 2.23? SD | 2.30? | 2.20? |
| | 670 recheck | 0.50 | 94.83 | 0.00 | 4.09 | 0.58 | 4.06 |

* Increase in sulfur content during treatment.

The nitrogen was Linde, high purity grade, and was passed through a sulfuric acid bubble counter, an absorption tube filled with Ascarite and, finally, an absorption tube filled with magnesium perchlorate (Anhydrone).

The hydrogen sulfide was prepared as used from iron sulfide and dilute sulfuric acid in a Kipp generator. It was washed with potassium hydrosulfide solution, dried with anhydrous calcium sulfate (Drierite), passed through a sample of easy processing channel black (Spheron 9) at 150°C., and finally dried by another treatment with anhydrous calcium sulfate. After purifying it was passed over the sample to be treated.

[NOTE 1: In most experiments nothing unusual was observed when hydrogen sulfide was admitted. However, in some cases water condensed on the cool portion of the outlet tube, and in a few cases a fine white coating (presumably sulfur) was noticed in the tube above the furnace. These experiments are marked in the tables by the letters SD for sulfur deposit. In some of these latter experiments (but not all), the sulfur values appear to be erratic.]

[NOTE 2: When opening the containers to take analytical samples, an odor like that of hydrogen sulfide was noticed. This was not observed immediately on completion of the preparation because the samples were transferred rapidly to bottles which had been swept with nitrogen. Two samples which had the strongest odor were reanalyzed after treatment with a stream of dry nitrogen for one hour at 150°C. No analytically significant change in the analyses was found. The sample of Spheron 9 which was treated with hydrogen sulfide for four hours at 150°C. had a very strong odor. This sample was placed in the combustion tube of the apparatus for determining sulfur and swept with oxygen for one hour at 150°C. This treatment removed no trace of the sulfur content of the sample. On standing in the closed bottles, all odor disappeared in one to two weeks.]

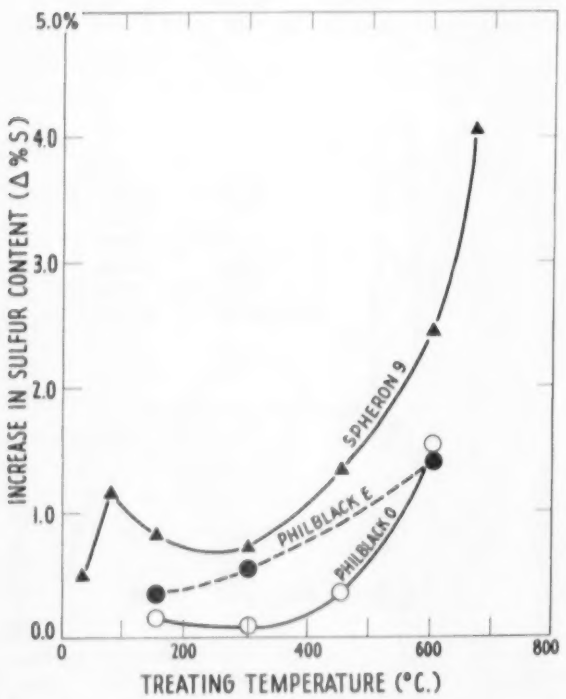


*FIG. 9—Effect of hydrogen sulfide treatment at various temperatures.*

## Effect of Treating Temperature

Table IX and Figure 9 show the effect of temperature on the ultimate composition of three samples of carbon black. These samples were approximately four years old when treated. All treatments were for periods of one hour. The sulfur content increases considerably during the 150°C. treatment, is significantly lower at 300°C., and increases materially at higher temperatures. Carbon disulfide formation should take place during the treat-

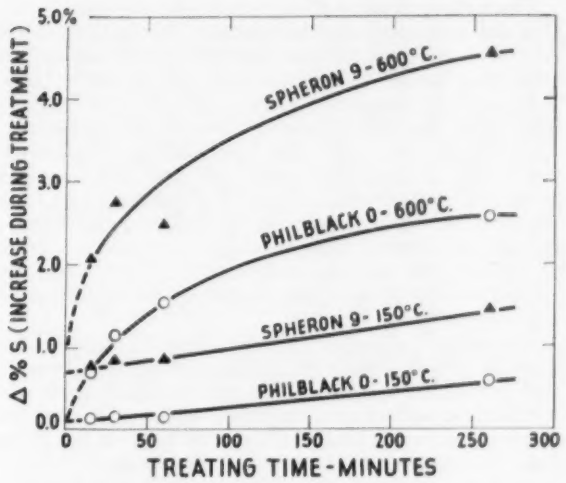


*FIG. 10—Hydrogen sulfide treatment of Spheron 9 and Philblack 0 for various times at two temperatures.*

TABLE X—TIME STUDY—HYDROGEN SULFIDE TREATMENT AT 150°C. AND 600°C.

| Sample | Treatment Time (Mins.) | Treatment Temp. (°C.) | Sulfur Content (%) | Δ%S* |
|---|---|---|---|---|
| Philblack O ..... | 15 | 150 | 0.47 | 0.14 |
| | 30 | 150 | 0.48 | 0.15 |
| | 60 | 150 | 0.48 | 0.15 |
| | 240 | 150 | 0.91 | 0.58 |
| | 15 | 600 | 1.01 | 0.68 |
| | 30 | 600 | 1.48 | 1.15 |
| | 60 | 600 | 1.86 | 1.53 |
| | 240 | 600 | 2.91 | 2.58 |
| Spheron 9 ..... | 15 | 150 | 0.77 | 0.74 |
| | 30 | 150 | 0.84 | 0.81 |
| | 60 | 150 | 0.86 | 0.83 |
| | 240 | 150 | 1.48 | 1.45 |
| | 15 | 600 | 2.09 | 2.06 |
| | 30 | 600 | 2.77 | 2.74 |
| | 60 | 600 | 2.48 | 2.45 |
| | 240 | 600 | 4.56 | 4.53 |

* Increase in sulfur content during treatment.

ments at 600° and 670°C. *(22)*. The increase in sulfur content (Δ%S) at 150°C. (Figure 9) is especially interesting and prompted the time study described in the following section.

### Effect of Treating Time

The Philblack O and Spheron 9 samples which were used in Table IX were treated with hydrogen sulfide for 15, 30, 60 and 240-minute periods at temperatures of 150° and 600°C. The sulfur contents were determined and are listed in Table X. The increases in sulfur content (Δ%S) are plotted against treating time in Figure 10. It seems evident from Figure 10 that the 150°C. treatment produces a very rapid increase in sulfur content, followed by a much slower increase. At 600°C. the velocity of the reaction makes this effect less obvious, but it is possible that the course of the reaction is similar at this temperature.

It is considered possible for hydrogen sulfide to add by 1,4-addition to the quinoid structure present in oxygen-containing carbon blacks *(30, 31, 32)*. This would probably be a relatively fast reaction. Catalytic hydrogenation in the presence of the Adams reduced platinum oxide catalyst is a measure of the quinoid oxygen—two atoms of hydrogen are taken up by the sample for each quinone-type oxygen atom present *(15)*. The 1,4-addition of hydrogen sulfide would involve the addition of a maximum of one sulfur atom for each quinone oxygen atom present, or one sulfur atom for every two hydrogen atoms taken up catalytically.

Seven samples of carbon black were treated with hydrogen sulfide for various periods of time at 150°C. The increases in sulfur content are plotted against catalytic hydrogen uptake in Figure 11. It should be pointed out that the experimental procedure is not designed for precise control of short treating times. The points which are plotted represent 15-minute and 30-minute treatments. The line of Figure 11 is drawn to represent the addition of one atom of sulfur for each quinone-type oxygen atom. The correlation is as good as the experimental data.

The properties of the carbon black which determine the slower reaction are not so obvious. However, it is not unlikely that this reaction involves substitution of hydrogen atoms at the carbon black surface. If so, this substitution should depend upon the hydrogen content and surface area of the samples, and would probably be retarded by oxygen atoms. However, our experimental data at high temperatures are too limited to justify detailed analytical treatment.

[NOTE: Rubber data were obtained on large samples of Spheron 9 and Philblack 0 treated with hydrogen sulfide at 150° and 600°C. However, the sulfur contents of these samples were considerably lower than for the smaller samples and the data are not reported in detail here. In general, the 150°C. treatment resulted in very little change in rubber properties. The 600°C. treatment of Spheron 9 produced changes comparable with those resulting from treatment with ammonia. The 600°C. treatment of Philblack 0 produced smaller changes, but in the same direction, as found by treating Spheron 9.]

## REACTION BETWEEN CARBON BLACK AND SULFUR

It has been shown *(1)* that carbon black and sulfur will react at the temperatures normally encountered during vulcanization. In the third paper of this series *(33)*

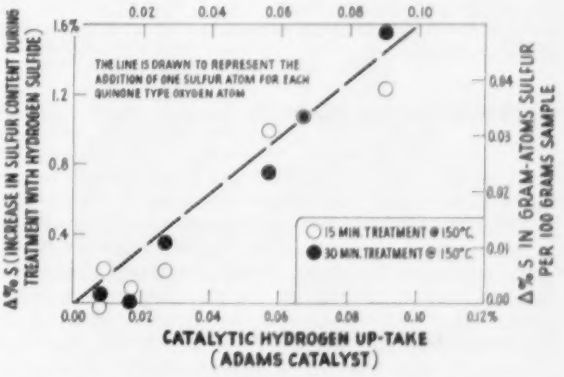


*FIG. 11—Increases in sulfur content versus catalytic hydrogen uptake.*

TABLE XI—HYDROGEN AND SULFUR CONTENTS OF CARBON BLACK SAMPLES BEFORE AND AFTER TREATMENT WITH SULFUR

| | Untreated Samples | | Sulfur-Treated Samples | | |
|---|---|---|---|---|---|
| Carbon Black | % H | % S | % H | % S | Δ % S |
| Spheron 9 | 0.71 | 0.03 | 0.26 | 15.02 | 14.99 |
| Spheron 6 | 0.55 | 0.00 | 0.37* | 8.76 | 8.76 |
| Spheron N | 0.37 | 0.02 | 0.27 | 12.37 | 12.35 |
| Philblack E | 0.34 | 0.35 | 0.35* | 9.99 | 9.64 |
| Philblack O | 0.31 | 0.43 | 0.23 | 6.75 | 6.32 |
| Shawinigan (Acetylene Black) | 0.09 | 0.06 | 0.10 | 1.30 | 1.24 |

* The samples of Spheron 6 and Philblack E increased in hydrogen content as indicated by analyses run on the samples after the usual drying procedure. On prolonged drying (48 hours @ 150°C. in dry nitrogen) their hydrogen contents were reduced to the values shown in this table. During this drying Spheron 6 lost 7.02% and Philblack E lost 7.60% of the weight of the dried sample. Further drying at 150°C. for a total of 168 hours did not reduce the hydrogen content. These losses on drying were much higher than the drying losses of the other samples and may represent toluene which was not removed by the vacuum drying.

experiments will be reported in which mixtures of carbon black and sulfur are heated at 150°C. for one hour and then extracted with toluene for 30 days to remove unreacted sulfur. It is shown that the amount of sulfur which combines with a given sample of carbon black is proportional to the product of its hydrogen content and surface area. Oxygen present on the carbon black surface appears to reduce the amount of sulfur which combines with the sample, but in the treatment described the effect is small.

If carbon black reacts with sulfur during vulcanization, and these considerations indicate that such reaction is probable, then it is quite possible that the sulfur so introduced would be present in a reactive form—possibly as thiol, disulfide or polysulfide groups.

Glass and Reed *(34)* have shown that benzene reacts with sulfur at 350°C. The products of the reaction are thiophenol, diphenyl sulfide, diphenyl disulfide, diphenylene disulfide (thianthrene) and hydrogen sulfide. Glass and Reed felt that thiophenol was the primary product and that the remaining materials were formed by the action of heat and sulfur on the thiophenol. Other aromatic hydrocarbons react with sulfur *(35)* and it does not seem unreasonable to consider the reaction of carbon black and sulfur to be similar to the reactions of aromatic hydrocarbons and their oxidation products (phenols, quinones, etc.). Sulfur is a dehydrogenating agent and is commonly used for this purpose in organic synthesis *(36)*. Hence, we might reason that the sulfur would dehydrogenate carbon black. As a matter of fact, hydrogen sulfide is given off when carbon black and sulfur are heated together.

## Experimental Treatment and Results

The amount of sulfur which combines with carbon black in one hour at 150°C. is not large enough to definitely demonstrate that dehydrogenation is taking place by ultimate analysis. Hence, experiments were conducted in which the carbon black was heated near the boiling point of sulfur for thirty days. The temperature control left much to be desired, but all samples were treated alike. The samples were then extracted with toluene for thirty days and vacuum dried at 150°C. Just prior to analysis, they were dried again at 150°C. in a stream of dry nitrogen for one hour. (Exceptions were Spheron 6 and Philblack E, see note to Table XI).

The hydrogen and sulfur contents of the samples before and after treatment with sulfur are listed in Table XI. The analyses indicate that all of the samples reacted with sulfur. The hydrogen contents of Spheron 9, Spheron 6, Spheron N and Philblack O were definitely reduced by the sulfur treatment (and toluene extraction). However, this was not found for Philblack E and acetylene black. It should be pointed out, however, that mere extraction with toluene increases the hydrogen content of the samples. If it is permissible to deduct the increase in hydrogen content brought about by toluene extraction from the hydrogen contents of the sulfur heated samples, all samples would have lost hydrogen during treatment with sulfur.

The action of sulfur on carbon black apparently results in dehydrogenation. Hydrogen sulfide is evolved, and the treated carbon black contains sulfur which cannot be removed by prolonged extraction. In fact, this sulfur is not completely removed by treatment for one hour in nitrogen at 1000°C. *(1)*. This action is similar to the action of sulfur on aromatic hydrocarbons *(37)*. It is believed that the amount of sulfur which combines with a given sample of carbon black is proportional to the product of the hydrogen content times the surface area. However, oxygen present on the surface reduces the amount of sulfur which combines with the carbon black. For short treatments at vulcanizing temperatures, this effect of oxygen is quite small; but it is quite evident when the treatment is prolonged at higher temperatures.

Since hydrogen sulfide is evolved when hydrogen containing organic materials are treated with sulfur, it may not be possible to separate the effects of hydrogen sulfide from those of sulfur. Most experiments in rubber and those reported here are subject to this uncertainty.

## SUMMARY

In this paper carbon blacks are shown to be chemically reactive materials. In their chemical reactions they appear to resemble polycyclic aromatic hydrocarbons which have been oxidized to various degrees. It is evident that the chemical reactions of carbon black should be taken into account in any serious study of the reinforcement of rubber.

ACKNOWLEDGMENT

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LITERATURE REFERENCES

(1) Studebaker, M. L., *Rubber Age*, Vol. 77, p. 69 (1955).
(2) Studebaker, M. L., "Proc. 3rd Rubber Technol. Conf. London," 1954, p. 623.
(3) Watson, W. F., *Ibid*, p. 553.
(4) Watson, W. F., *Ind. Eng. Chem.*, Vol. 47, p. 1281 (1955).
(5) Gessler, A. M., *Rubber Age*, Vol. 74, p. 59 (1953); Zapp, R. L., and Gessler, A. M., *Ibid*, Vol. 74, p. 243 (1953); Gessler, A. M., and Ford, F. P., *Ibid*, Vol. 74, p. 397 (1953); Rehner, J., Jr., and Gessler, A. M., *Ibid*, Vol. 74, p. 561 (1954).
(6) Barton, B. C., Smallwood, H. M., and Ganzhorn, G. H., *J. Polymer Sci.*, Vol. 13, p. 487 (1954).
(7) Doak, K. W., Ganzhorn, G. H., and Barton, B. C., *Canadian J. of Technol.*, Vol. 33, p. 98 (1955); reprinted in *Rubber Chem. Tech.*, Vol. 28, p. 895 (1955). (Also, a considerable number of recent patents cover the use of various promoters).

(8) Bradley, R. S., *J. Colloid Sci.*, Vol. 11, p. 237 (1956).
(9) Lewis, W. K., and Metzner, A. B., *Ind. Eng. Chem.*, Vol. 46, p. 849 (1954).
(10) Smith, R. N., Pierce, C., and Joel, C. D., *J. Phys. Chem.*, Vol. 58, p. 298 (1954).
(11) Smith, R. N., Duffield, J., Pierotti, R. A., and Mooi, J., *J. Phys. Chem.*, Vol. 60, p. 495 (1956); *Anal. Chem.*, Vol. 28, p. 1161 (1956).
(12) Emmett, P. H., *Chem. Rev.*, Vol. 43, p. 69 (1948).
(13) Loebenstein, W. V., and Deitz, V. R., *J. Phys. Chem.*, Vol. 59, p. 481 (1955).
(14) Goring, G. E., Curran, G. P., Tarbox, R. P., and Gorin, E. *Ind. Eng. Chem.*, Vol. 44, p. 1051 (1952); *Ibid*, Vol. 44, p. 1057 (1952). Also Goring, G. E., Curran, G. P., Zielke, C. W., and Gorin, E., *Ibid*, Vol. 47, p. 820 (1955).
(15) Studebaker, M. L., Huffman, E. W. D., Wolfe, A. C., and Nabors, L. G., *Ind. Eng. Chem.*, Vol. 48, p. 162 (1956).
(16) Studebaker, M. L., *India Rubber World*, Vol. 127, p. 215, 225 (1952).
(17) Studebaker, M. L., *Ibid*, Vol. 129, p. 485 (1954).
(18) Mixter, W. G., *Amer. J. Sci.*, Vol. 45, p. 363 (1893).
(19) Hill, W. H., in "Chemistry of Coal Utilization," edited by H. H. Lowry, Vol. 2, p. 1014, Wiley, New York (1945).
(20) Wibaut, J. P., "Proc. Intern. Conf. Bituminous Coal," 3rd Conf. 1931, p. 657 (1932).
(21) Hofmann, U., and Ohlerich, G., *Angew. Chem.*, Vol. 62, p. 16 (1950).
(22) Owen, A. J., Sykes, K. W., and Thomas, D. J. D., *Trans. Faraday Soc.*, Vol. 47, p. 419 (1951).
(23) Owen, A. J., Sykes, K. W., Thomas, D. J. D., and White, P., *Ibid*, Vol. 49, p. 1198 (1953).
(24) Owen, A. J., Sykes, K. W., and Thomas, D. J. D., *Ibid*, Vol. 49, p. 1207 (1953).
(25) Bedford, C. W., and Gray, H., *Ind. Eng. Chem.*, Vol. 15, p. 720 (1923).
(26) Booth, E. W., and Beaver, J. D., *Ind. Eng. Chem.*, Vol. 32, p. 1006 (1940).
(27) Bloomfield, G. F., *J. Soc. Chem. Ind.*, Vol. 67, p. 14 (1948).
(28) Fisher, H. L., *Ind. Eng. Chem.*, Vol. 31, p. 1381 (1939).
(29) Craig, D., Juve, A. E., Davidson, W. L., Semon, W. L., and Hay, D. C., *J. Polymer Sci.*, Vol. 8, p. 321 (1952).
(30) Snell, J. M., and Weissberger, A., *J. Am. Chem. Soc.*, Vol. 61, p. 450 (1939).
(31) Waters, W. A., "The Chemistry of Free Radicals", 2nd Edition, London (1948), p. 236.
(32) Fieser, L. F., and Fieser, M., "Organic Chemistry", 2nd Edition, Boston (1950), p. 761.
(33) Studebaker, M. L., and Nabors, L. G., "The Chemistry of Reinforcement. III. Model Systems Containing Carbon Black and Squalene." (In press).
(34) Glass, H. B., and Reed, E. E., *J. Am. Chem. Soc.*, Vol. 51, p. 3428 (1929).
(35) For instance: Palmer, G. D., Jr., and Lloyd, S. J., *Ibid*, Vol. 52, p. 3388 (1930).
(36) Plattner, P. A., in "Newer Methods of Preparative Organic Chemistry" p. 21, New York (1948).
(37) Marschalk, C., *Bull. Soc. Chim.*, Vol. 6, p. 1122 (1939).

## Non-Stretchable Seamless Rubber Belt

A seamless rubber belt that will not stretch, has been developed by the Armstrong Cork Co., Lancaster, Penna., to help solve industrial drive and feed-belt problems. The belt has a sturdy, straight-line cord interliner, vulcanized between two layers of tough, synthetic rubber to prevent stretching and eliminate the possibility of slippage. The flexibility of the belt makes it suitable for diversified use such as in drive belts on dictating machines, tape recorders, industrial pumps and compressors, or as feed belts on packaging machines, duplicating machines and postage meters. The belts can be made in many lengths, widths and thicknesses and produced with almost any type of rubber. The cord interliner may be any size from fine yarn to tire cord, depending upon the specific use required. The belt is manufactured in black and white. The special rubber compounds have a high surface friction that assures excellent power transmission chararcteristics. A lower coefficient of friction can be achieved by means of special treatment. The belts are designed to operate smoothly and quietly even on small diameter pulleys as their seamless construction does away with the audible thump that glue-seam belts may cause, the company says. The belts also have a built-in resistance to oils, solvents and ozone cracking and they are unaffected by changes in humidity, according to officials of Armstrong Cork.

## *Coming Next Month . . .*

**"The Compounding of Transparent Rubber"—by Ralph F. Wolf, Columbia-Southern Chemical Corp., Barberton, Ohio.**

The first part of a two-part article which discusses the use of fine particle size silica reinforcing pigments in the production of vulcanized natural rubber having both good transparency and physical properties. Part II, which will appear in March, 1957, will cover styrene-butadiene, nitrile, butyl and neoprene rubbers.

**"The Chemistry of Reinforcement. II—Scorch in Natural Rubber Stocks Containing Carbon Black"—by Merton L. Studebaker and Lester G. Nabors, Rubber Chemicals Division, Phillips Chemical Co., Akron, Ohio.**

The second part of a three-part article which begins in this issue. It covers the chemical interaction of carbon black and hydrogen sulfide.

**"Equipment for High-Temperature Tensile Testing" by Thomas F. Lavery, Frank S. Grover, Sydney Smith and Leland J. Kitchen, Research Laboratories, Firestone Tire & Rubber Co., Akron, Ohio.**

Discussion of an apparatus and method which have been developed for measuring the tensile and tear properties of elastomers at elevated temperatures.

**"How Engineered Cooling Paid Off for Western Backing and Coating Co." — by Burt Wetherbee, Pasadena Equipment & Supply Co., Pasadena, Calif.**

An account of how high-level coated fabric uniformity was attained through exact control cooling.

*Moderator and Panelists for the Symposium on Softeners for Compounding Rubber*

# Softeners for the Compounding of Rubber

## A Report on a Symposium Held by the Akron Rubber Group

THE FALL Meeting of the Akron Rubber Group, which was held on October 26, 1956, at the Sheraton-Maytlower Hotel in Akron, Ohio, featured a symposium on "Softeners for the Compounding of Rubber." The four panel members who participated in the program each delivered a short talk on the various types of softeners and this was followed by a question-and-answer period. A. E. Juve, of the B. F. Goodrich Research Center, Brecksville, Ohio, served as the panel moderator, and set the tone for the meeting in his introductory remarks.

The following subjects were covered at the symposium by the panelists noted: *Petroleum Products,* Stewart S. Kurtz, Jr. (Sun Oil); *Pine Products,* Lyle O. Amberg (Hercules Powder); *Coal Tar and Polymerized Products,* Paul O. Powers (Pennsylvania Industrial Chemical), and *Ester Plasticizers,* Maxwell A. Pollack (Wallace & Tiernan).

In his introductory remarks, Dr. Juve stated that the term "softener" is one of the many terms used in the rubber industry which is not very clearly defined or clearly understood. Taking his definition from the recently published ASTM Glossary, Dr. Juve explained that a softener is "a material added in relatively small amount to a rubber compound to render the mix more plastic and so facilitate processing. Also a material added in larger amount to lower the hardness of the vulcanizate. Examples are pine tar, stearic acid, mineral and vegetable oil, esters and mineral rubber." Dr. Juve claimed that this is not an entirely adequate definition.

In practice, he stated, the compounder is inclined to class any material which is liquid as a softener. However, a liquid accelerator or antioxidant which will soften the batch is generally excluded. Also, chemical plasticizers which are added specifically to soften rubber are not generally classed as softeners. Certain materials which are solid at room temperature, such as resins and waxes, are also called softeners. The term "softener" would seem to imply, Dr. Juve observed, that addition of such a material would produce a softening, either of the uncured mix or of the vulcanizate. Frequently it does both, but in special cases it does one and not the other.

The speaker stated that while statistics on the consumption of softeners are difficult to obtain, he finds that there are approximately 265,000 long tons consumed per year in the rubber industry. This figure excludes fatty acids and resin acids present in GR-S type rubber which approximates 37,000 long tons. In obtaining these figures, Dr. Juve said, an attempt was made to exclude plasticizers used with PVC. Calculated another way, for every 100 parts of rubber consumed approximately 15.5 parts of softener are consumed.

In continuing his introductory remarks, the speaker stated that the specific purposes for which softeners are used are many and include: reduction in viscosity of the mix, lubrication for extrusion or calendering, tackifying, detackifying, as a diluent, to lower vulcanizate hardness, to lower vulcanizate freezing point, to improve ozone resistance, to activate the cure (as with fatty acids and pine tar), to increase or decrease the coefficient of friction, and for reclaiming. Frequently, he noted, the softener performs a dual or multiple function.

In introducing the panel, Dr. Juve observed that the classes of softeners discussed by each excluded, for reasons of time, many materials such as vegetable oils, phenolic resins, fatty acids, liquid rubbers, and waxes other than those derived from petroleum. Most of these, however, are of minor importance and the softeners which the panel members did discuss represent the major types consumed.

The talks made by the panelists and the questions asked and answered are reproduced herewith.

# Petroleum Products

By STEWART S. KURTZ, Jr.
*Sun Oil Company, Marcus Hook, Pennsylvania*

SOFTENERS and extenders of petroleum origin which are used in rubber include both solid and liquid materials. Asphalts, tars, resins, waxes and oils are all used. Rubber consists of long chain-like molecules which are linked together in the curing operation. Softeners provide internal lubrication which permits more freedom of motion of the chains relative to one another; in other words, less internal friction and less heat build-up.

Softeners, in general, are cheap relative to the polymer. There are, therefore, both economic and quality considerations which encourage the use of softeners. The practical problem is to find the right balance between cost and quality in the finished article which goes to the ultimate consumer. The old saying, "Pennywise is sometimes pound foolish", applies. Cheap oils can easily lead to poor products.

Where relatively little motion is involved and color is not important, as in some grades of floor tile and some grades of mechanical goods, extremely viscous materials, such as asphalts and pitches, are satisfactory as softeners. An ingenious mechanical goods compounder can hold together a lot of asphalt and filler with very little rubber.

There are a good many grades of asphalt used in rubber compounding. For softeners, very soft asphalts, sometimes called asphaltums, are generally used. Where good resilience is desired, asphalts must, however, be used in very limited amounts, since the large, sluggish molecules are relatively poor internal lubricants in the rubber mass. Other solids, such as resins of petroleum origin and wax, are used as softeners.

Wax is a petroleum oil which melts above room temperature. There is no precise definition of where oil stops and wax begins. The pertinent point in regard to wax is its ability to crystallize as a thin film on the surface of cured rubber. For this reason, it can be used to give protection against cracking when rubber is exposed, under static conditions, to air and sunlight.

Asphalts and wax are important in rubber compounding but are used in much smaller volumes than processing oil. Last year (1955), about 200,000,000 pounds of petroleum oil were used in the rubber industry.

The properties of the oils which go into the rubber are important. Oils of low molecular weight have low viscosity and are good internal lubricants, but may be too volatile. Oils of high molecular weight have high viscosity and may be less desirable as internal lubricants, but they are less volatile.

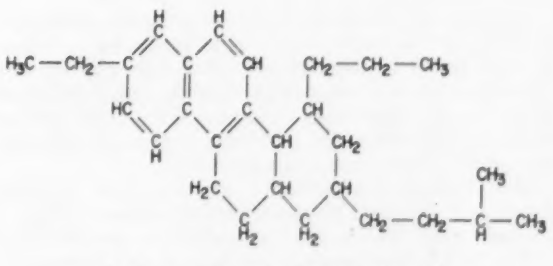

*FIG. 1—Formula For Sundex 53*

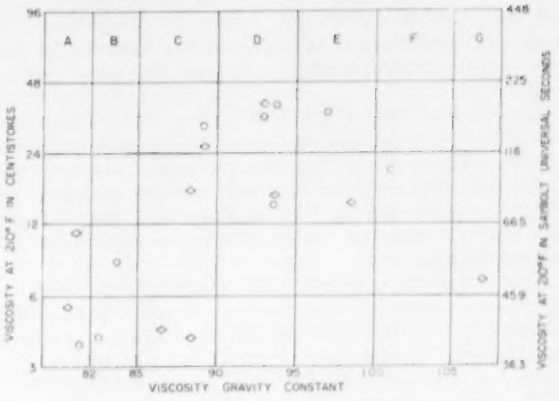


*FIG. 2—Viscosity versus viscosity gravity constants for petroleum softeners.*

It is desirable, therefore, to use an oil of as low molecular weight as is consistent with volatility requirements. Molecular weight can be estimated from viscosity and gravity with sufficient accuracy for such comparisons. Flash point is a good control of the lowest boiling part of the oil.

Petroleum oils are made up of carbon atoms in aromatic rings, naphthenic rings and paraffin chains. Rapid methods are now available for getting the composition on this basis, which is called "carbon type analysis".

An "average molecule" in one of our commercial rubber processing oils (Sundex 53) has 26 carbon atoms so arranged that there are 10 carbon atoms in the aromatic structure, 8 carbon atoms in the naphthenic structure, and 10 carbon atoms in the paraffinic structure (see Figure 1). On a carbon type analysis basis such a molecule is 36% $C_A$, 28% $C_N$, and 36% $C_P$.

Commercial oils sold for use as softeners have a wide variety of composition as discussed in a recent paper, namely:

% $C_A$ may vary from 0% to 50%
% $C_N$ may vary from 20% to 45%
% $C_P$ may vary from 20% to 75%

In the case of the butadiene-styrene type of copolymer, there is little tendency for oil of any type to bloom out at loadings up to 50 parts. However, oils do vary in the rate at which they are taken up in the Banbury. Carbon type composition, we believe, correlates with this behavior. Viscosity-gravity constant, low temperature properties, oxidation stability, etc. are also related to carbon type composition.

A very simple classification system which works very well for oils has been published. Viscosity in centistokes is plotted vertically on a log scale. This is proportional to molecular weight. Viscosity-gravity constant, which is a function of composition, is plotted from left to right. This sorts out oils both according to type and to molecular weight.

As an example of the use of this chart, we have spotted most of the rubber processing oils which are in use in the rubber industry in substantial amounts, and a few of more extreme composition which are still somewhat experimental although commercially available (see Figure 2). The oils designated with diamonds are Sun Oil Products.

The paraffinic oils (V.G.C. .790-.820) are good for non-staining and good low temperature properties, but are taken up slowly by the rubber. In other words, a relatively long time is required in the Banbury to get homogeneity with paraffinic oils and butadiene-styrene rubber.

Naphthenic oils (V.G.C. .850-.900) are good all-around oils. They incorporate reasonably well and are relatively good on low temperature properties, color, oxidation resistance, etc. The very low viscosity oils, below 6 centistokes, are rather volatile. Very high viscosity oils produce oil-extended rubber which has poor low temperature properties.

The relatively aromatic oils (V.G.C. .900-.950) incorporate faster but the viscosity range which is also suitable in regard to both volatility and low temperatures is relatively narrow. Oils in this class are widely used both for oil-extended rubber and in compounding.

The aromatic oils (V.G.C. .950-1.000) are all relatively poor in regard to oxidative degradation, and suffer either from being too volatile or too viscous at low temperatures. Oils having high viscosity at low temperature give poor low temperature properties in rubber. Oils of this sort have special uses, as in Neoprene WHV, but our laboratory does not recommend them for general use in butadiene-styrene rubber.

The material which reacts most readily with 85% $H_2SO_4$ is of interest. This material is a mixture of basic nitrogen compounds and other reactive material of uncertain structure. By "basic nitrogen" we mean nitrogen compounds like amines which react easily with acid. We believe that this material is a probable source of variability both in regard to cure time and in regard to oxidation degradation. The less there is of this reactive material, the better.

With regard to Neoprene WHV and other relatively "oil-resistant" polymers, extender oils can also be used in loadings up to 50 to 100 parts. With such oil-extended polymers, oil will migrate to the surface unless it is carefully selected. For such use an oil should be very high in aromatic ring carbons on a carbon type analysis basis. It should also be low in truly saturated molecules, which can be determined by silica gel.

Oils act as internal lubricants in polymers. The oil for use in oil-extended rubber should be carefully selected keeping in mind molecular weight and volatility, carbon type composition and processability, low temperature properties, oxidation resistance to minimize oxidative degradation, etc.

Modern methods for the analysis and characterization of oils provide much information and require relatively simple laboratory data, namely, viscosity, gravity and refractive index.

# Pine Products

**By L. O. AMBERG**

*Hercules Powder Company, Wilmington, Delaware*

THERE are three commercially important sources of rosin and terpene chemicals. These are the living tree, the pulpwood and paper industry, and aged pine stumps. In addition, another familiar natural rubber softener, pine tar, is obtained from pine tree wood.

The living tree yields gum rosin and gum turpentine. The most important species is the fast-growing slash pine of southern U.S.A. Gum rosin production resembles that of natural rubber. V-shaped incisions are cut in the trunk of the tree and the exudate, which is called "crude gum turpentine," is collected in containers much as latex is gathered. The rosin is then separated from the turpentine "spirits" by distillation. Because of the large amount of labor used, and the increasing cost of labor, this source of pine products is steadily decreasing in importance.

One of the by-products of the pulp and paper industry is tall oil, which contains very nearly equal parts of rosin and fatty acids. Tall oil soap is separated from the effluent cooking liquors resulting from the alkali-treated shredded pine wood—the pulp—and cooked with mineral acid to obtain crude tall oil. The rosin can be separated from the fatty acids by any one of a number of processes.

The third major source of rosin and terpene chemicals is aged long-leaf pine stumps. After the stumps have remained in the ground for about ten years the bark and sapwood have largely disintegrated, leaving the heartwood, which is the portion rich in rosin and terpenes. The properly aged stumps are pulled from the ground with highly specialized stump pullers and transported by truck or train to centralized processing plants where rosin and terpenes are recovered through an extraction process. The clearing of cut-over pine land serves a useful purpose in that it restores the land for agricultural use or for reforestation.

Pine tar has long been made by destructive distillation of pine wood. It is so closely associated with natural rubber products that it has been said that during World War II it was found there was little consumer resistance to the new GR-S tires if enough pine tar was incorporated to make them "smell like rubber." Pine tar is an excellent softener and processing aid for natural rubber in applications where some discoloration can be tolerated.

In keeping with modern technology, the primary resin and terpenes are only the starting point for a group of widely diversified end products. A substantial number of these end products are helpful in some way to the rubber industry.

Although rosin as such finds some use in the rubber industry, it is made into far more useful products through chemical modification. For example, the undesirable effects of ordinary rosin on the aging resistance of rubber, and particularly natural rubber on outdoor aging, are eliminated by stabilization through modification of the abietic-type rosin acids.

Modifications commercially available are dehydroabietic acid in which the unsaturation appears within an aromatic ring, which is more stable, or dihydroabietic acid in which less unsaturation is present. The abietic-type acid in rosin may be converted to dehydroabietic

acid by heating in the presence of a catalyst, or to dihydroabietic by hydrogenation. The resulting increased stability of these materials is seen in the reduced amount of oxygen absorbed by the stabilized rosins as compared with unmodified rosins.

Ordinary rosin absorbs about 10% of its own weight of oxygen when exposed in finely pulverized form under pressure at room temperature for a week. On the other hand, the stabilized rosins absorb only a fraction of 1% oxygen under the same conditions. To the rubber compounder, this reduction in oxygen absorption means better resistance to deterioration, especially in natural rubber.

Laboratory tests and practical experience leave little doubt that unmodified wood rosin and gum rosin may contribute to exposure cracking of natural rubber while the stabilized rosins are at least as good a control without rosin. The normal outdoor exposure of natural rubber containing the resins quite readily demonstrates the advantages of stabilization. However, we have not been able to simulate these effects employing the usual accelerated test methods. A quite elaborate program comparing these and other materials under accelerated aging conditions, including the oxygen bomb and air-oven techniques, failed to show any consistent differences among stabilized rosins and ordinary rosins. This failure of laboratory tests to correlate with service life in the case of rosin and stabilized rosins has contributed to some confusion concerning the relative effects of these materials.

## Uses of Stabilized Rosins

The principal values of stabilized rosins in rubber compounding are as pigment dispersing agents, processing aids, and tackifiers, as well as plasticizer-extenders for rubber compounds. They are used, for example, in substantial quantity in tire compounding for both black and white sidewall tires. In the white-wall tires they are used not only in the white sidewall portion, but also in the backing stock because of their complete lack of coloring and staining.

Stabilized rosins find uses in many other kinds of rubber compositions, including mechanical goods, surgicals, drug sundries, and household specialties. One substantial outlet is in floor tile where they are used in quantities up to about 10 parts on the polymer. They contribute very usefully to the rate and degree of dispersion of the high pigment loadings. A special modification of a stabilized rosin is Hercules Resin 913. It has similar properties except that the mild cure-retarding effect of resin acids has been obviated; it also is well suited for floor tile applications.

One of the special properties of the stabilized rosins is their ability to make uncured and semicured compounds exceedingly extensible. This property of hydrogenated rosin is used in sponge rubber compositions where it imparts a stringy kind of tenacity to uncured and semicured compounds. This property, plus the pigment dispersing ability of the stabilized resin, results in a larger number of smaller pores in sponge rubber with a given amount of blowing agent; or conversely, more uniform pores of a given size with less blowing agent. Rosin acids should allow reduction or complete omission of acid activaters for blowing agents where they are required.

An advantage of hydrogenated rosin is that, when used with hydrated calcium silicate filler, it gives a measure of the reinforcement of high styrene resins.

So far we have discussed rosins made useful by disproportionation or hydrogenation. There is, however, another modification of rosin which yields a product peculiarly useful to the rubber compounder. Under proper conditions, rosin may be partially dimerized to give an increased melting point and reduced oxygen absorption compared to rosin. As Poly-pale resin, for example, polymerized rosin is used in compositions where some extra hardness of compound is desired. Polymerized rosin is treated further to yield a material which consists primarily of dimeric resin acids.

As in the case of disproportionation, dimerization also reduces oxygen absorption to a fraction of the absorption shown by rosin. Such a material is commercially produced as Dymerex resin. Use of this material as a rubber compounding resin is steadily developing. Even though it is essentially a rosin whose molecular weight has been no more than doubled by dimerization (to about 650), it will perform some of the functions of very high molecular weight high-styrene-butadiene resins with many times its molecular weight. At the same time the cost of Dymerex is less than half that of high-styrene resins.

## Compatible With Nitrile Rubber Compounds

One of the materials which can be obtained from aged pine stumps is the gasoline-insoluble fraction, Vinsol. This low-cost resin is very compatible with nitrile rubber compounds and is a useful product where neither low-temperature properties nor color are critical limiting properties. Probably because of its phenolic content, Vinsol can be used to give improved high-temperature resistance. Since compared with other plasticizers it can be utilized in quite large quantities, Vinsol can be used to reduce the costs of nitrile rubber compositions having good aliphatic hydrocarbon resistance. While Vinsol is somewhat limited in its use in the hydrocarbon rubbers, quite satisfactory compositions can be made provided a second plasticizer, such as Dutrex 22, is included to act as a co-solvent.

Terpenes (such as dipentene) are liquids, and are used in rubber compounding as softeners and as processing aids. They also effectively promote pigment dispersion. One of the important uses of terpene softeners is in rubber reclaiming. They are especially valuable in nonstaining reclaims; for example, in automotive floor mats they allow the use of light colored decorative coatings because they do not discolor on migration.

Pine products, chiefly pine tar and rosin and terpene chemicals, contribute substantially to supplying the requirements of the rubber compounder. By hydrogenation, disproportionation, or polymerization, rosin may be stabilized so that it can be used in oxidation-resistant rubber compounds. Hydrogenation and disproportionation yield resins which are useful as softeners, tackifiers, processing aids, and dispersing agents in a multitude of rubber compounds, ranging from heavy-duty truck tires to the lightest colored rubber tile on a kitchen floor. Polymerization of rosin results in a reinforcing resin which is used to impart rigidity to rubber floor tile and shoe soles.

A gasoline-insoluble resin which is a co-product with wood rosin may be used to impart elevated temperature aging resistance and lower cost to nitrile rubber compounds where color and low-temperature flexibility are not limiting factors. In addition to being softeners, terpene solvents are used to promote pigment dispersion. They also are used in the manufacture of reclaimed rubber.

# Coal Tar and Polymerized Products

By P. O. POWERS
*Pennsylvania Industrial Chemical Corp., Clairton, Penna.*

COAL tar pitches were among the early softeners used with rubber but they have largely been replaced by other hydrocarbon material, often not derived from coal tar. Selected raw materials from coal tar, petroleum or other sources are polymerized to produce softeners with controlled properties.

Coal tar softeners are available in a variety of color grades and as soft or hard resins. These materials are entirely aromatic in structure, but will vary somewhat in the properties they impart to a rubber compound, depending on softening point and solubility characteristics. These softeners work well with nitrile type rubbers and with neoprene.

The aromatic softeners also are available as viscous liquids, up to 248° F. softening point resins, and from quite dark to pale materials. These resins have a high aromatic content but are not so aromatic as the coal tar resins, and some of them can be used with oil-resistant rubbers.

The non-aromatic polymers are available only in lighter colors and cannot be used with oil-resistant rubbers. However, they work well with natural and styrene-butadiene type rubbers. Polyterpene resins behave in a similar manner.

The earlier discussion has shown the effects associated with aromatic and naphthenic structure. The trends revealed these can be extended, since the spectrum of structures available in coal tar and polymeric softeners are much wider than in the softeners available from petroleum oils, since materials containing entirely aromatic structure or totally devoid of aromatic structure are available. Also, the softeners can be produced in a wide range of molecular weights.

The aromatic resins are the most efficient and active softeners. They impart greater strength and greater resistance to cut-growth than the naphthenic or paraffinic softeners, particularly in mechanical goods. The improvement in physical properties in non-black stocks with resins of this type is well known and is pronounced. The limiting factor in the use of these resins is the brittle point and rigidity of the compounds. Another detrimental effect is their rather poor light stability.

The naphthenic resins are well exemplified by polyterpene resins. These resins are particularly useful for increasing the tack of natural rubber. They are often used where good color stability is essential. Another resin entirely devoid of aromatic structure is Picopale. This resin readily softens natural and styrene-butadiene rubber.

There is no doubt coal tar and polymeric softeners could be used as softeners for oil-extended synthetic rubber with advantage. However, price factors may rule out the use of large amounts of these materials. They should be considered as modifiers of petroleum products.

Coal tar resins are widely used in flooring, both as softeners for the synthetic rubber and with the high styrene-butadiene resins used in this field. The choice of the resin can be greatly modified by the solubility of the resin employed, and high modulus, high durometer stocks can be obtained by the use of less soluble resins. Monomeric styrene is frequently used as a component of such resins.

The coal tar and aromatic resins are also used in soling, and, here again, the solubility of the resin, measured by the cloud point, greatly affects the properties of the compound. Resin solubility gives a control of the hardness of the stock. Picopale also has been used in soling, particularly because of its light color, but also because of other special advantages.

In the reclaiming of rubber, a wide variety of softeners is used, ranging from volatile coal tar hydrocarbons up to fairly high melting resins, and all types of materials are presently employed in this field. Resinous materials, particularly the aromatic type, are employed because of the better physical properties obtained in their presence. Both aromatic and non-aromatic materials are widely used in this type of application.

# Ester Plasticizers

By MAXWELL A. POLLACK
*Harchem Division, Wallace-Tiernan Co., Belleville, N. J.*

IT IS my pleasure to talk about the special breed of softeners known as ester plasticizers. These materials are entirely synthetic and are made by reacting alcohols with acids. The alcohols and acids are available primarily from the organic chemical industry, and include such alcohols as butyl, hexyl, octyl, capryl, glycol and glycol ethers, and such acids as sebacic, adipic, azelaic, phthalic, phosphoric and octanoic. By combining these and similar materials in different ways, literally thousands of different esters can be produced. Of these, about sixty have become commercially important as plasticizers. In 1939, the total production of plasticizers in this country was about 30 million pounds. This business has grown since that time, to the point where last year some 400 million pounds were produced. It does not look as if the end of this growth is in sight.

Plasticizers perform a great many roles in industry, and one of the most dramatic and important jobs they do is the way they make a hard, horny plastic-like polyvinyl chloride highly flexible and elastic. When plasticizers are used with rubber, their effects are not that striking, and their main job is to make better elastomers out of good ones.

The role that ester plasticizers play in rubber is, for the most part, a rather limited one. This restriction is due mainly to their higher prices as compared with other softeners, and they are only used where their superior performance is absolutely essential. Perhaps their most

important quality is their ability to keep rubbers from stiffening at extremely low temperatures. This property is vital for uses in the arctic regions or in aircraft operating at high altitudes. Most rubbers will lose some measure of softness, resilience and elasticity under such conditions, and some are much more seriously affected than others. In particular, the nitrile rubbers and polychloroprene often depend upon ester plasticizers to improve their low temperature properties.

Why should anyone pay 30, 50, or even 70 cents a pound for ester plasticizers, when he can choose from a wide variety of other softeners which cost less than 10 cents a pound? Obviously, because the cheaper products just won't do the same job. What, then, are the special features of ester plasticizers that make them so useful?

Compatibility is one. When you have an oil-resistant rubber, obviously you can't use just ordinary oils to plasticize it. What can you use? Well, you go back to a basic rule for compatibility — like attracts like. Since oil-resistant rubbers are distinguished by their content of highly polar structures, such as nitrile and chlorine groups, we look for plasticizers among those compounds which also contain highly polar groups. Since the ester group is highly polar and conveniently produced in industry, we certainly take a long look at esters. We find that when we add ester plasticizers to polar rubbers, there is a mutual attraction set up between the ester groups of the plasticizers and the polar structures of the rubbers. This attraction keeps the plasticizer from bleeding out, which is what would happen if we tried to use most hydrocarbon oils as plasticizers.

Permanence is another important and special feature. Any products that we want to use as plasticizers must stay in the goods for the expected useful life of the article, or they are not any good. This means that, first of all, they must be of high enough molecular weight so that they will not be lost by volatilization either during processing or during use. The minimum requirement for this varies according to the application, but most ester plasticizers for rubber have molecular weights of 300 or higher. There are many ways in which a synthetic molecule can be put together to give a molecular weight of around 300. For example, we might take sebacic acid, which has a molecular weight of 202, and esterify it with two molecules of butyl alcohol, which has a molecular weight of 74. In this process two molecules of water are split out and we wind up with the plasticizer dibutyl sebacate, which has a molecular weight of 314.

If our application is one demanding outstanding resistance to heat, we might look at plasticizers with molecular weights around 400. To achieve this, we could, for example, take sebacic acid and esterify it with octyl alcohol, which has a higher molecular weight than butyl alcohol. In this way, we would produce dioctyl sebacate, with a molecular weight of 426.

Suppose we should require outstanding resistance to extraction by solvents. To achieve this quality, we might need to go to molecular weights of 2000 or more. One way to do this is to esterify sebacic acid with a glycol. The use of a glycol instead of a simple alcohol permits the esterification reaction to continue until a polymeric plasticizer is produced of the desired molecular length to make it resistant to extraction.

As can be seen, one of the great benefits we get from the synthetic chemical industry is that it makes available so many raw materials that one can almost (and please note that word "almost") tailor-make a plasticizer to suit a specific requirement. One thing to keep in mind in the production of high molecular weight plasticizers is that it isn't enough just to choose high molecular weight ingredients. It is also necessary to insure that the selection of ingredients and the ways they are put together maintain the proper balance of polar and nonpolar groups so that other properties, such as compatibility and efficiency, are not lost.

When it comes to low temperature performance, ester plasticizers range from very poor to outstandingly good. There has been a lot of work done trying to understand what is necessary for outstanding low temperature performance. Undoubtedly, several factors are involved, and perhaps the most important of these is the viscosity of the plasticizer. If you examine the low temperature performance of plasticized rubbers, you find that the lower the viscosity of the plasticizer, the better the low temperature results.

The physical basis for this is not hard to understand. Today it is generally recognized that the elastic properties of rubber are best explained on the basis that the molecules are in violent agitation. This behavior is directly attributed to the energy of the heat in the system. When the temperature is lowered, the forces acting on the rubber molecules are reduced, and the movements of the latter become sluggish. This is particularly noticeable with those molecules which have "hooks" on them, such as the polar structures in the oil-resistant rubbers. To get away from this sluggishness and make the rubbers more elastic and resilient, we add plasticizers.

Well, then, it seems that we have simplified our problem. When we want low temperature performance, all we need to do is use thin liquids as plasticizers. This, however, is only part of the story, because if we take a group of liquids with equally low viscosity at room temperature and chill them, we will find that some will solidify and among those that remain liquid, some will thicken much more than the others. Ideally what we would like to have are liquids that will not thicken at all at low temperatures. We can measure the degree of thickening by the viscosity index, which is simply an inverse type of ratio of the viscosity of a liquid at two different temperatures. In industry, we recognize as most desirable those plasticizers of highest viscosity index, for these show the least change of viscosity with temperature.

Our first thought about any plasticizer which froze solid at, say, ice temperature, is that it couldn't be any good as a plasticizer at 65° F. below zero. The actual facts may belie this, however, and we find that if the plasticizer is compatible with the rubber, its behavior in the rubber bears no relation to its freezing point in the pure state. It is like what happens when salt is dissolved in water. Although salt has a melting point of about 1500° F., it markedly lowers the freezing point of water when it is dissolved.

There are, of course, many other problems and requirements involved in the selection and use of plasticizers, and in a short talk like this, it is impossible to do more than hint at them. We have mentioned some of the special features of ester plasticizers, particularly those which are good for low temperature work. Some of the more important plasticizers used in rubbers for improvement of low temperature performance include dibutyl sebacate, dioctyl adipate, dibutyl phthalate, tributoxy-ethyl phosphate, trioctyl phosphate, butyl oleate, di-isobutyl adipate, TP-90-B, Plasticizer SC and Harflex 500.

# Questions and Answers

**Question:** Which type of petroleum softener gives the best tread crack resistance in synthetic treads (GR-S type)—highly aromatic or highly paraffinic?

***Answered by Dr. Kurtz:*** The facts on tread crack resistance were obscure 30 years ago, and they still are. A primary factor is tread design and the temperature to which the tread is cooled before the tire is broken out of the mold. Cracks can be started right there before the tire ever gets on a wheel.

Assuming that the tread design and curing is properly done, then, I believe, the best way to avoid tread cracking and also crack growth is to keep the stock as soft as is practical without getting into tread wear trouble. This is in line with the paper presented by Auer and Schaffner of U. S. Rubber in Atlantic City, which showed that low modulus and high elongation at break usually give low crack growth.

Tread cracking and crack growth are probably an oxidation effect which is promoted by local stress and susceptibility to oxidation. A soft stock reduces local stresses; an oxidation-resistant oil gives some protection on the oxidation side.

All aspects of a compound must be considered in the study of crack resistance. We recommend compounding and curing of a relatively soft stock using an oil which is relatively resistant to oxidation. Highly paraffinic oils are hardly practical because of processing and tack trouble. Naphthenic oils are good for this use. Aromatic oils are more likely to oxidize, but have been said to be satisfactory in regard to crack growth in soft stocks.

**Question:** What mixing procedure will give best dispersion of a tread compound (natural rubber) when using (a) petroleum, (b) pine tar softeners? Also, discuss the effect of carbon black dispersion of (1) various types of softeners, (2) time of addition of softeners to the batch.

***Answered by Mr. Amberg:*** Largely independent of the choice of softener, the best pigment dispersion is obtained by keeping the viscosity of the mix as high as is practical until after the incorporation of pigments. Also, the pigment wetting effects of the softener (especially one of the pine products such as pine tar or hydrogenated rosin) is helpful in obtaining the best dispersions. A compromise often is made in which part of the softener is added to the mixer on top of the polymer and the remainder on top of the pigment loading.

**Question:** From the standpoint of the varying characteristics desired in finished rubber compounds, do you think it would be possible to have a "universal" softener? What would its characteristics have to be? If a "universal" softener could be developed, would the cost factor be minimized?

***Answered by Dr. Kurtz:*** The nearest thing we have to a universal softener is an oil with V.G.C. between .850 and .900 and viscosity between 12 and 24 centistokes at 210 (66 to 116 SUS 210). Such an oil can be used for a wide variety of applications. This does not make it a universal softener. There would not be four panelists here today if a wide variety of softeners were not needed.

**Question:** What softener or combination of softeners is recommended for nitrile rubber compounds to provide (a) maximum uncured tack, (b) maximum uncured adhesion, and (c) minimum plasticity and maximum recovery?

***Answered by Mr. Pollack:*** For good uncured tack and cured adhesion, I would suggest the highly aromatic softeners, preferably of the higher molecular weights. For minimum plasticity and maximum recovery, the low viscosity ester plasticizers would be best. The specific products in each of these classes that would be best for any particular job would depend on such factors as compound cost, softener level, design of product and service required.

**Question:** What low temperature plasticizer can be used in conjunction with butadiene-styrene carcass stocks which impart some building tack?

***Answered by Dr. Powers:*** In this case we believe the final result will be a compromise. Coal tar resin should be used in amounts to give the required tack, but not in sufficient amounts to affect the low temperature properties. The result will be a balance between the two properties desired.

**Question:** When employing high oil loadings in treads, does blending of different oils prove beneficial, and what are the recommended types?

***Answered by Dr. Kurtz:*** We recommend for high oil loadings the more oxidation-resistant and less viscous oils in the 0.850 to 0.950 V.G.C. range. If a highly aromatic oil is used in the base polymers, we recommend that any additional oil added in compounding be of the naphthenic or even paraffinic type, to improve the average oxidation resistance and low temperature properties of the final compound.

**Question:** What type of softener is best to prevent camelback (tread rubber) from increasing in Mooney value on aging?

***Answered by Mr. Amberg:*** Assuming that a curative system with good stability on storage is provided, incorporation of a stabilized rosin-type softener would be expected to improve scorch resistance both during processing and on long-term storage.

**Question:** Do any plasticizers enhance (increase) electrical conductivity in rubber?

***Answered by Dr. Juve:*** In natural rubber, GR-S and the nitrile rubbers, plasticizers would be expected to have little effect on conductivity, except in those cases in which high conductivity had been attained by the use of conducting blacks when they would be expected to have an adverse effect, i.e., increase resistance. In neoprene, where the conductivity in stocks not pigmented with carbon blacks is due to ionic conductance, the addition of plasticizers should lower the resistance. However, in carbon black stocks the effect is likely to be adverse. Specific plasticizers which might enhance conductivity would be halogen-containing materials in which the halogen is unstable. A stable halogen-containing plasticizer should have little effect on conductivity.

**Question:** What are the relative tendencies toward migration into adjacent compounds of commonly used tire compound softeners, particularly those used in oil-extended polymers, and if a natural rubber carcass compound is cured next to an oil-extended tread, how much is the oxidation resistance of the natural rubber compound affected by the oil migration? Are some oils worse in this respect than others?

***Answered by Dr. Kurtz:*** Since softeners act as lubricants between adjacent rubber molecules and do not form chemical bonds, migration can occur with any of the softeners used with tires. This migration is probably a slow process and is influenced by the viscosity of the oil and the time and temperature history of the tire. It is reasonable to expect that the plasticizers which have the lowest molecular weight and viscosity will migrate fastest. With regard to oxidation resistance of either natural or synthetic rubber, oils with medium or low aromatic carbons are better. In other words, the less chemically reactive material the better. In terms of the Rostler analysis, the less the nitrogen bases the better. The manner in which natural rubber is compounded is also important. When natural rubber is used in breaker strips, it is good practice to compound this to withstand softening effects caused by migration.

**Question:** Why does the use of some softeners (resins) affect the mill roll to which a stock will run? That is, the stock can be made to run on either the fast or the slow roll by proper selection of softener.

***Answered by Mr. Amberg:*** It is true that for a given set of conditions, softeners often may be selected which will determine which roll the stock will run on. However, friction ratio, temperature, and temperature differential also have effects. In turn, these effects vary, depending on the individual softener. Knowing that these factors exist, an experienced operator usually can put a stock on the correct roll regardless of the softener.

***Answered by Dr. Powers:*** It is a little difficult to become too general on the reasons for the batch following one roll or the other. It is at least in part a matter of temperature and the temperature viscosity characteristics of the particular resin. Coal tar resins and aromatic resins, in general, have a rather steep viscosity temperature gradient and may go through the sticky range at a rather narrow temperature level. The non-aromatic materials are somewhat less temperature susceptible and, in general, tend to have a wider range of temperatures where they become tacky.

**Question:** What properties of oils affect physical properties of rubber compounds? For example, low viscosity light process oils tend to produce higher modulus values in natural rubber compounds than do higher viscosity aromatic softeners.

***Answered by Dr. Kurtz:*** This is an odd question. To the best of our knowledge a low viscosity light process oil will give a lower modulus stock than a more viscous oil of the same type. The only reversals I know of are where the oil is so volatile that it is lost by evaporation. In such a case, enough light oil may be lost to make a substantial difference in the amount of oil present. At equal volume oil loading and equal cure, the more viscous oil will usually give the higher modulus, higher tensile and usually the lower elongation at break. Viscosities for this purpose should be compared at the temperature at which the rubber will be tested. For good low temperature properties, a light paraffinic oil is best. Naphthenic oils are better than aromatic oils at low temperature.

**Question:** Passenger treads with cap and base construction employing a typical cold rubber tread will permit how much oil extension in the base?

***Answered by Dr. Kurtz:*** We have been told that it is practical to use a 50-50 blend of regular butadiene-styrene rubber and 37½ parts oil-extended rubber in the base.

**Question:** Discuss applicability of various plasticizers to nitrile rubbers.

***Answered by Mr. Pollack:*** As indicated previously, ester plasticizers are used in nitrile rubbers primarily for two reasons: one, for improvement of low temperature performance, the other for resistance to extraction by solvents and other media. Low viscosity esters are used for the low temperature work, and, in addition, these esters usually impart to the stock high resilience, low compression set, high elongation and low durometer. For good resistance to extraction, the polymeric esters are used and these tend to give high durometer, poorer resilience and outstanding heat service.

**Question:** Does it look as if pine products, such as pine tar and pine oil, will continue to be available, and at what price levels?

***Answered by Mr. Amberg:*** First, I have been assured that there is an ample long-range supply of the basic raw materials—pine wood, pine stumps, and tall oil. Second, I have been assured with equal firmness that the producers of pine products intend to remain in business. Wood gathering methods have advanced so that it is now practical to clear land that previously could not be cleared economically. It is to be expected that further improvements in harvesting methods will, in turn, result in utilization of areas not now worth working.

Looking back over the last ten years to check trends in domestic production capacity, we find the supply of wood and gum rosin maintained at the 1,000 million pound level. The figures for pine tar show sustained production of about 5 million gallons per year during the same period. The terpene products which are produced along with pine tar and rosin were similarly stable in production. Temporary shortages of pine products in the past always have been corrected by the laws of supply and demand. Rapid changes in the requirements of the industry may, as in the past, create temporary imbalances. However, from the long term view it is reasonable to expect that demand will continue to determine the availability of pine products. The same demand will have a part in determining price levels. Pine products must, of course, remain competitive in price with other types of softeners.

**Question:** Has the use of high softener ratio proven satisfactory for oil-extended polymer usage in carcass compounds, and what ratio per hundred parts total polymer is practical?

***Answered by Dr. Kurtz:*** Comparatively little oil-extended rubber is now used in carcass construction. However, an equilibrium will develop between the oil in the tread and the carcass compound. We would not, at this point, rule out the use of a little oil-extended rubber in carcass compounds.

**Question:** What tests are most critical in indicating the uniformity of the softeners as applied to coal tar products?

***Answered by Dr. Powers:*** The most critical tests in indicating the uniformity of coal tar and polymeric softeners are the softening point and the density. Since these materials are made from selected stocks under controlled manufacturing conditions, they are quite uniform in properties and a specification of the density and melting point should insure uniform products for the various commercial types.

***Answered by Mr. Pollack:*** For esters, we use the specific gravity, color, actual analysis for ester content, and usually include tests for residual unreacted acids and alcohol. Additional tests if required might include viscosity and refractive index.

***Answered by Mr. Amberg:*** Acid number and melting point ordinarily are sufficient tests for establishing the uniformity of rosins, while specific gravity, boiling range, and refractive index are used as control tests for terpenes. I have been informed that the best tests for pine tar are viscosity, specific gravity, and moisture content. Carefully controlled production of pine products ensures very uniform products, and these tests should be sufficient.

***Answered by Dr. Kurtz:*** Processing oils for the rubber trade are closely controlled for uniformity by manufacturing specifications. Properties which we consider important are viscosity, gravity, color, aniline point, and flash point, all of which may be easily obtained in the laboratory. These properties are controlled during manufacture and can be used to characterize oil as to type. Additional data which are sometimes useful are: refractive index, from which carbon type composition can be obtained, and 85% $H_2SO_4$ extractables if degradation effects in polymers are under consideration.

**Question:** What softeners are best for oil-extended rubber, both in extending the rubber and also in compounding the extended rubber?

***Answered by Dr. Kurtz:*** The first part of this question has been covered in the introductory remarks. In compounding oil-extended rubber, we recommend adding additional oil which has the least tendency for oxidative degradation. Specifically, a naphthenic oil of satisfactory viscosity, volatility and color.

**Question:** What type softeners give best aged properties to rubber?

***Answered by Mr. Amberg:*** It is most likely that the effect of softeners on aging resistance is associated with the varying tendency of the materials to enter into a three-way interaction with oxygen of the air and the polymer molecule. Modern technology has created softeners in all four classes which are oxidation resistant and which, therefore, give good aged properties to rubber compounds.

**Question:** What group of plasticizers are best for flex resistance of natural rubber compounds and how do polymerized oils affect flex resistance of natural rubber compounds?

***Answered by Dr. Powers:*** In general, aromatic resins improve the flex resistance of natural rubber compounds.

**Question:** How high a ratio of oil-extended polymer is advisable when blended with natural rubber for commercial truck tires?

***Answered by Dr. Kurtz:*** So far as we know, oil-extended rubber has been used in blends up to 50% in small and medium size truck tires. In large truck or bus tires, so far as we know, oil-extended rubber is not used. There is a lot of variation on this.

**Question:** Give the effect of various softeners on these properties of tread stocks: (a) rate of cure, (b) aging, (c) cut resistance. Also, how do the four classes of softeners compare for resistance to (a) oven aging and (b) oxygen bomb aging of a natural rubber body stock?

***Answered by Mr. Amberg:*** The rate of cure of most natural and synthetic compounds is somewhat slower when using the rosin-derived resins. However, experience has shown that when accelerator level is increased to compensate for the slower cure, the resulting compound usually has improved processing safety compared with those containing non-rosin compounds. We have observed in the laboratory that, discounting diluting effects, the petroleum products are about neutral, while some coal products accelerate slightly and some retard to a very small degree.

I assume that cut resistance refers to cut growth of synthetic tread on flexing. Our laboratory tests consistently show an advantage for rosin-derived softeners over non-rosin types after the test samples have been hot-air aged to simulate the effect of hot running of tires. This probably reflects an observed improvement in retention of elongation on hot-air exposure.

As I mentioned in the preliminary discussion, we have not been very successful in using the air oven or the oxygen bomb to demonstrate any important differences among the rosin-derived softeners (and a few non-rosin materials used as controls) in natural rubber compounds. In the answer to another question I discussed the effect of reactivity with oxygen on practical outdoor exposure resistance of natural rubber compounds.

**Question:** What is the best type and amount of softener for natural rubber treads and synthetic rubber treads?

***Answered by Dr. Kurtz:*** This is probably as good a question for starting an argument as can be thought up. Natural rubber will take 4 to 5 parts of either pine tar or petroleum oil without difficulty. Thirty years ago pine tar was definitely the preferred softener. Now, less distinction is made between pine tar and petroleum oils. Some work has been done with oil loadings above 5% and with high black loadings in natural rubber. I am not sure how practical this is.

For styrene-butadiene treads, we believe that best results are obtained with high Mooney cold rubber extended with an oil in the 0.850 to 0.950 V.G.C. range, such as Circosol 2XH or Sundex 53. Up to 37½ parts oil on polymer (27 in extended polymer) is satisfactory in the smaller tires. For non-oil extended synthetic treads, the oil is in the range of 5 to 15 parts.

In large tires, such as truck and bus tires, natural rubber is preferred. In small tires, oil-extended synthetic rubber is very satisfactory. Treads of intermediate size tires are often blends of natural and synthetic rubber, and are also intermediate in softener content.

**Question:** Give the general compounds to which each of the four types of softeners are most applicable and the most distinctive compound property imparted by each type.

***Answered by Dr. Kurtz:*** Petroleum softeners can be used in natural rubber, butadiene-styrene rubber, neoprene and nitrile rubbers. The amount of petroleum oil used in natural rubber is of the order of 5%, whereas in high Mooney butadiene-styrene rubber 27% (37½ parts) can easily be used. In regular neoprene, a low molecular weight naphthenic oil has been standard for years. In high Mooney neoprene, more aromatic oils are needed.

Petroleum products are used in all types of rubber compounds, both flexible and non-flexible. From our viewpoint, there are two distinctive effects imparted by their use. These are their ability to aid processing during mixing and subsequent fabrication, such as extrusion, and to maintain a good over-all balance of physical properties in the end product. The properties desired in the finished article, of course, dictate which of the many types of softeners are best suited for the application. Not to be overlooked is the use of oils as extenders in low cost items. In these cases the reduction in cost may be the most important property gained by their use.

***Answered by Mr. Amberg:*** The answer for pine products was contained for the most part in my general comments. One or more of the pine products may be used in practically all kinds of rubber compounds. Probably the most distinctive properties common to all the pine products are that they give increased building tack and help to disperse pigments.

***Answered by Dr. Powers:*** The coal tar and polymeric plasticizers should not be regarded as a single group but should be broken down into aromatic and non-aromatic materials. The aromatic resins have the best compatibility and are adaptable with oil-resistant synthetic rubbers. In general, they improve the stiffness, the processing characteristics and cut resistance of compounds. Their only limiting factor is the increase in stiffness and brittle point. The non-aromatic materials are indicated where the softer compounds are desired.

***Answered by Mr. Pollack:*** Ester plasticizers should be considered to include at least two distinctly different types, the monomeric and the polymeric esters. The monomeric type is commonly used for improvement of low temperature performance. These esters are generally compatible with most of the rubbers on the market, but are mainly used with the oil-resistant types of rubber. This is because the other plasticizers available to the oil-resistant rubbers are mainly aromatic products derived from natural sources, and they give very poor low temperature properties.

I think ester plasticizers should be considered for use wherever price is not a limiting factor and the best possible low temperature performance and resilience are desired. If, for example, you are using low viscosity hydrocarbon oils as low temperature softeners, you invariably have high volatility and losses from the stock. By proper selection of esters, you can not only have your cake but eat it as you can get softeners that are not only better for low temperature performance, but also much less volatile and therefore more permanent.

The other class of esters, the polymerics, are all of much higher viscosity and therefore do not compare with the monomeric esters for low temperature work. However, the polymerics are probably best of all available softeners when it comes to resistance to extraction by fuels, oils or other media.

**Question:** Discuss the possibility of a low temperature plasticizer (−70°F.) that will resist extraction in fuels and oils.

***Answered by Mr. Pollack:*** In every business there are easy jobs and there are tough ones. This is not one of the easy jobs. There has been probably more research money spent on this problem than on any other single plasticizer problem. I appreciate the wording of the question. Some people would have asked, "What plasticizer will do this job?" I do not know who asked the question, but he obviously knows something of the difficulties here, and he was kind enough to ask about the *possibility* of such a plasticizer. All this is prelude to the statement that I don't know of any plasticizer which will do this job at present. Secondly, I am happy to summarize what I know about the attempts to make such a plasticizer.

Much of the work has had to do with trying to make a monomeric plasticizer of low viscosity which will not be soluble in fuels and oils while it will still be highly compatible with the rubber. In this work, researchers have been guided by the fact that changes in chemical structure can make big differences in solubility, compatibility and low temperature performance. To get plasticizers of greatly different structures from the fuel and oil hydrocarbons, they have tried to include as much oxygen, nitrogen, sulfur and other non-hydrocarbon groups as possible. In this way, a number of plasticizers have been made which were indeed insoluble in fuels and oils. However, they failed in actual service tests for one or more of the following reasons: they were not compatible, or did not give good enough low temperature performance, or were still extracted in spite of their being insoluble in the extractant. This last effect is probably explained on the basis that the extractant is taken up by the rubber to some extent. Since the plasticizer is insoluble in the extractant, it is then thrown out of its solution in the rubber.

Another approach has been to improve the low temperature properties of polymeric plasticizers which are not extractable. Here, again, the work has to do with the intimate details of the chemical structure. We know that if we can get high enough molecular weight, we can get non-extractability. High molecular weight generally goes with high viscosity and consequently poor low temperature properties. The problem then becomes: How can we get a combination of high molecular weight and low viscosity all in the same molecule? We do know, however, that chemical structure makes a tremendous difference in the viscosity of polymers.

For example, we might have on the one hand a hard aromatic resin with a molecular weight of less than 1000 which has a very high viscosity, while on the other hand we have a polyester made from sebacic acid and a glycol with a molecular weight of 7000, but with a much lower viscosity than the aromatic resin. Such a polyester would be vastly superior from the point of view of combining low temperature properties with non-extractability. The trouble is that no one has been able to build a polyester or related type of plasticizer which approaches minus 70°F. performance.

As I said before, it's a tough problem, but we do know something about the requirements, and it's entirely possible that someone will come up with a good answer before too long.

**Question:** What plasticizers are available that will resist oven temperatures to 250°F., low temperatures of minus 40°F., and are not extracted by petroleum solvents?

***Answered by Mr. Pollack:*** For complete resistance to extraction and excellent heat service, I would suggest the polymeric ester plasticizers. To achieve minus 40°F., the medium acrylonitrile content rubbers should be used with them.

**Question:** In laboratory abrasion measurements, softeners, particularly in large amounts, lubricate the abrasive and give reduced abrasion loss. To what extent do high softener levels contribute to resistance to tread wear of tires on the road by "lubricating" the road?

***Answered by Dr. Juve:*** This question is suggesting that perhaps the good abrasion resistance of oil-extended treads is really an illusion. I think that this is unlikely for the reason that, with minor exceptions, the road surfaces can be considered as a continuous, clean abrasive surface. That this is probably the case is indicated by the fact that on abrasion testers in which a dust is used to prevent gumming of the abrasive a high oil-containing stock behaves normally. One of the exceptions to the concept of the road surface as a continuous, clean abrasive surface is the accumulation of gunk on the surface of concrete highways which does reduce the abrasiveness of the road surface. The source of the gunk, however, is not the tire being run at a particular time, but grease and crankcase oil and perhaps oils from tires previously run over the same track.

**Question:** What is the significance of the "cloud point" of coal tar resins and its effect on rubber compounds?

***Answered by Dr. Powers:*** The cloud point of coal tar resins is the temperature at which a 70% solution of the resin in white oil clouds. The higher the cloud point the poorer the solubility of the resin in rubber, and above 100°C. cloud point there may be difficulties in dispersing the resin.

The cloud point of the resin indicates its behavior in natural or synthetic rubber compounds. As the cloud point increases, the hardness and modulus increase markedly while ultimate tensile decreases slightly. This is true of natural rubber and styrene-butadiene and nitrile type synthetic rubber compounds.

**Question:** In softeners, what is the chemical nature of acidifins? Of the nitrogen bases?

***Answered by Dr. Kurtz:*** The sum of nitrogen bases and the first and second acidifins is about the same as the total aromatics as determined by silica gel separation. The silica gel separation is a lot easier to run and results are more reproducible. The fraction called "nitrogen bases" in the Rostler analysis does contain the complex molecules which contain one or more atoms of nitrogen in acid reactive structures. The so-called "nitrogen bases" in many oils also include reactive aromatics which are not nitrogen bases.

**Question:** What are the relative merits of the Rostler Analysis and the Sun Oil Analysis of petroleum softeners?

***Answered by Dr. Kurtz:*** The method of analysis published by Kurtz and Martin gives rather complete information. The percent aromatics and percent saturates are obtained by silica gel separation. These fractions are further analyzed so that when everything is summed up we have the percent carbons in aromatic rings, the percent carbons in naphthenic rings, and the percent carbons in paraffinic rings. Many of the properties of oils are related to the composition as expressed on this basis.

As discussed in Minneapolis last fall (1955) and in Cleveland this spring (1956), a very fast analysis for % $C_A$, %$C_N$ and %$C_P$ can be made if viscosity, gravity and refractive index are known. Professor Waterman of Delft, Professor Edwin Smith of Ohio State University and the Shell Oil Company have also presented methods for %$C_A$, %$C_N$ and %$C_P$ based on physical property correlations. This is not just a Sun Oil Company point of view. It is an oil industry and university point of view.

The analysis by %$C_A$, %$C_N$ and %$C_P$ is related to viscosity-gravity constant. Viscosity is related to molecular weight. This is about all the information you need for dealing with softener oils for butadiene-styrene polymers. Viscosity, gravity and refractive index are the basic data needed.

A color measurement or the determination of % extractable with 85% acid (Rostler so-called Nitrogen Base Test) can be used as an additional indication of the probable amount of chemically reactive material present.

For oil-resistant rubber such as high Mooney (WHV) neoprene, we also need to know how much saturated material is present since this will "bleed out" or "sweat out" first. A silica gel separation is the quickest and easiest way to get this. The % saturates can also be obtained as the unreacted residue after Rostler's three acid treats. This is the hard way of getting the information.

The Rostler method, when it was originally proposed, was a worthwhile though empirical approach to the composition of extender oils. It has served its purpose.

**Question:** What is a satisfactory softener for Neoprene 571 latex that is more or less ultra-violet light resistant?

***Answered by Dr. Powers:*** Picco Emulsion No. 12 should be a satisfactory softener for Neoprene 571 latex and this material has good ultra-violet stability.

**Question:** What are the prospects for lower cost plasticizers for low temperature tire service?

***Answered by Mr. Pollack:*** Looking at this as a future possibility, I think that the prospects for lower cost plasticizers are reasonably good. There are two trends that point that way. First of these is the continuing price reductions as the industry builds up and volume grows. Secondly, there is a great deal of development work in progress on creating new products and learning more about how to use the old ones. These are both avenues by which the rubber industry stands to benefit.

**Question:** Name a good non-staining system or combination of softeners which may be used to tackify carcass compounds composed of SBR (GR-S) and natural rubber blends.

*(Continued on Page 725)*

# *Editorials . . .*

## Major Impact

A REVIEW of the activities of the rubber manufacturing industry in 1956 and a preview of such activities for 1957 as seen by the editors forms part and parcel of the current issue. This section, abetted by an 8-page coverage of statements from outstanding authorities from practically every major segment of the industry, stands completely on its own. Accordingly, the editorial this month will not treat with the current and future status of the rubber industry, which is customary for the initial issue in a new year. We highly recommend a thorough reading of the review-and-preview section.

Even a glance through the section in question will indicate that numerous factors have a direct bearing on the fortunes of the domestic rubber manufacturing industry. Many of these are outside factors over which domestic policies have little effect, such as the Suez Canal incident or the outbreak of hostilities in Indonesia. There is, however, one domestic program in the making which will have a major impact on almost every American industry, one which will constitute a growing and ever more important share of the gross national product. We are, of course, talking about the new highway building program which according to latest estimates will involve outlays of at least $50 billion before 1972.

A previous editorial (September, 1956) contained some very interesting statistics concerning the materials which will be required for this program, for which the Federal Government has pledged $33 billion spread over a thirteen-year period. As the master plan begins to unfold several additional facts become available which begin to spell out the tremendous impact of the overall program on the American economy. There are now three major parts to the master plan, breaking down to the following:

(1) A 41,000-mile system of national interstate and defense highways. When completed, this will link 90% of all cities with a population of more than 50,000 and carry 20% of all traffic. For the interstate system, the Government will contribute $24,825,000,000 to be matched by state funds of $2,875,000,000 on a 90 to 10 basis.

(2) Federal aid for 700,000 miles of primary and secondary roads throughout the country. The Government's share will come to approximately $7½ billion in the next three years, matched dollar-for-dollar by the states.

(3) Federal funds for national park, forest and Indian reservation roads, totaling $448 million in three years.

There can be no doubt that this vast outpouring of funds, both Government and state, which will increase from year to year, will help to ease any sharp dips in the over-all economy, none of which is currently in view. The benefits derived from the mounting expenditures will unquestionably spread out in ever-widening circles, benefiting both management and labor. It has been estimated that by 1960, when the highway program is at or near its peak, there will be some 900,000 persons working on the Federal-aid roads alone.

Some intimation of the relationship between this huge road building program and the manufacturers of both tire and non-tire rubber products was given in our previous editorial. It may be recalled that we stressed the fact that although it is extremely difficult to estimate the amount of rubber for non-tire uses which will be required by the thousands of machinery units needed for the program in the next thirteen years (57,000 new road building units are required for each billion dollars spent for highways), it would certainly be a very substantial figure, running into the tens of thousands of long tons. As vague as this statement may be, it is factual.

Since our previous editorial, however, we have had an opportunity to make an informal survey in an attempt to pin down some specific figures. We have learned that whereas there is a total of approximately 110 pounds of rubber in the modern passenger automobile, exclusive of tires, there are approximately 130 pounds of rubber in the typical giant road building machine, again exclusive of tires. Since the highway program will cost $33 billion over the next thirteen years, and since it takes 57,000 units of road building machinery for each billion dollars spent, it means that the program has opened up a market for at least 250,000,000 pounds of new rubber products.

We emphasize the fact that these figures are exclusive of tires. Yet every tire manufacturer is fully aware of the impact of this program on the tire industry. Every road building unit takes 6, 8 or more tires, and these are the large, off-the-road units. The tire requirements for these road building mammoths during the tenure of the 13-year program are somewhere between 11,000,000 and 16,000,000 units. And think of the replacement demand for passenger tires once these highways have been built! It has been estimated that by 1975 there may be as many as 100,000,000 motor vehicles in use.

Yes, the future of the rubber manufacturing industry is, to put it mildly, quite good.

# Highlights Sidelights *of the News...*

January, 1957

The General Services Administration has completed its survey of government agencies to determine their interest in operating the government-owned synthetic rubber laboratories in Akron, Ohio...Replies from 24 government agencies are said to have ranged from "no interest" to "some interest"... It is now believed that the laboratories will be placed on the market in the near future and the public bids will be weighed against the government agency bids before any final disposition is made (page 685).

A preliminary investigation into the activities of the Rubber Business Advisory Commttee is reported to have been undertaken by Congress...The House Committee on Government Operations is said to be interested in a recent vote taken by the advisory group on the stockpiling question when the nine manufacturing members and the nine dealer members lined up to take opposing positions...The Government Operations Committee is apparently interested in the fact that each group within the advisory body voted to protect its own interests (page 687).

The government has abandoned plans to lease the alcohol-butadiene plant at Louisville, Ky., and it is reported that legislation will soon be introduced which will authorize sale of the plant for general chemical use without a requirement that it be used for the production of synthetic rubber...Publicker Industries and Union Carbide were the only two companies which had expressed an interest in leasing the plant, and both offers were termed "unacceptable" by the Federal Facilities Corporation (page 685).

The civil suit brought by Goodrich against U.S. Rubber charging infringements of patents in the manufacture of tubeless tires has been dismissed by the United States District Court in Baltimore...It was ruled that the type of tubeless tire manufactured by U.S. Rubber did not infringe on the Goodrich patent...Goodrich has announced its intention to appeal the decision (page 686).

The Canadian rubber footwear industry has submitted a brief to the Canadian Tariff Board in which it appeals for higher duties against the threat of growing imports of rubber footwear from low wage countries...The brief contends that Canadian footwear exports, now at one-third of previous levels, have been virtually eliminated by competition from overseas (page 710).

# NEWS REPORTS and Industry Activities

## GSA SEEKING INDUSTRY BIDS FOR LABORATORIES AT AKRON

The General Services Administration has completed a survey of government agencies which was aimed at determining their interest in operating the government-owned synthetic rubber laboratories in Akron, Ohio. A GSA spokesman has stated that replies from twenty-four government agencies ranged from "no interest" to "some interest". GSA will not disclose details on government agency "bids" because disclosures would presumably prejudice chances for a high public offer.

An official of GSA advises that the pilot plant and laboratory facilities at Akron will be placed on the market "sometime after the first of the year," probably late in January. Bids in response to this invitation will be opened sixty days after the offering.

Under special disposal legislation passed last summer, GSA offered the laboratories to every government agency having a possible interest for research or any other use. The government survey, however, must be followed by an invitation for public bids.

When GSA completes the public bidding phase, including negotiations if necessary to obtain a realistic offer, the entire matter will be turned over to the Bureau of the Budget. GSA and the Bureau of the Budget will then weigh the bids from private firms against uses proposed by government agencies to determine the public interest.

The laboratories, constructed in 1943, were operated by the University of Akron until recently. They are now in standby condition.

### ADM Buys Interest in Dutch Firm

Archer-Daniels-Midland Co., Minneapolis, Minn., has purchased an interest in Scado Kunstharindustrie, N. V., a leading Holland manufacturer of resins and plasticizers. The name of the company will be changed to Scado-Archer-Daniels, N. V., and T. L. Daniels, ADM president, will join its board of directors. ADM has also licensed Scado to use its formulas and technical knowledge in the manufacture of ADM resins, copolymers and plasticizers. The European company will serve the Netherlands, Belgium and engage in export marketing.

### Research Pays Dividends

Companies that consistently reinvest 3% or more of their sales income for well-directed research show an average growth rate 2½ times faster than those that spend only 1%, according to James M. Flounders, director of new products development for B. F. Goodrich Industrial Products Co., Akron, Ohio, who spoke recently at a Rotary Club meeting in Marietta, Ohio. " . . . Many companies," Mr. Flounders stated, "now derive the major portion of their sales revenue from products that did not exist ten years ago."

### Heyden-Newport Deal Approved

At special meetings held recently in New York City, stockholders of Heyden Chemical Corp. and Newport Industries, Inc., by a more than two-thirds vote, approved the plan for the acquisition of the assets of Newport by Heyden in exchange for Heyden common stock in the ratio of 1½ shares of Heyden for 1 share of Newport and the assumption by Heyden of all of Newport's liabilities. The name of the combined companies will be changed to Heyden Newport Chemical Corp. The 31,000 outstanding shares of the Newport preferred stock will be called for redemption on the closing date at $103 per share plus accrued dividends.

### Arco Rubber Closes Plant

Automotive Rubber Co., Detroit, Mich., has taken over the business of its Houston, Texas subsidiary, Arco Rubber Processors, which closed its plant on December 31. Arco, which had operated a plant in Houston since 1951, had planned to build a $500,000 plant on a recently acquired 28-acre tract in Houston. Those plans have been changed due to decreasing sales and labor difficulties. A company official stated that Arco's lease had expired and Automotive Rubber did not, at this time, want to tie up too much capital in building a plant in Houston. He pointed out that company sales in 1955 were about $1,000,000 and estimated sales for 1956 at about $750,000.

## GOVERNMENT ABANDONS PLANS TO LEASE LOUISVILLE PLANT

The government has apparently abandoned plans to lease its alcohol-butadiene plant at Louisville, Ky., on a long term basis and has announced that it will ask the new Congress to approve legislation permitting the sale of the plant. Negotiations had been under way since November 1, 1956, with Publicker Industries, Inc. of Philadelphia, Penna., and Union Carbide & Carbon Co. of New York, N. Y., for a period of from five to fifteen years. Publicker and Union Carbide were the only two companies who had expressed an interest in the facility.

Laurence B. Robbins, administrator of the Federal Facilities Corporation, stated that the final lease offers of both concerns were unacceptable, and that negotiations had been terminated. FFC, he added, will recommend that Congress give it due authority to sell the plant.

Details of the legislative recommendations were not disclosed by Mr. Robbins, but the agency is expected to ask for authority to sell the plant for general chemical use. Such a proposal was made to Congress last session, only to be turned down by the House Armed Services Committee. The plant is currently under lease to Publicker until April, 1958.

### Styrene Price Drop Reported

According to current reports, the price of styrene will be reduced by approximately four cents a pound effective July 1, 1957. This price decrease will apply to both the type of styrene consumed in the manufacture of synthetic rubber and the type used by plastics manufacturers. With the price cut, styrene sold to synthetic rubber manufacturers will be priced at about twelve cents a pound and that sold to plastics manufacturers at sixteen and one-half cents a pound. The trade reports that styrene producers and consumers have been in conflict over the question of price for some time. The matter was recently brought to a head when one major synthetic rubber producer announced plans to construct a styrene plant with a capacity of 100 million pounds a year. This announcement, the trade believes, prompted styrene producers to announce the price cuts.

## GOODRICH SUIT AGAINST U.S. RUBBER DISMISSED BY FEDERAL COURT

A civil suit brought by the B. F. Goodrich Co. against the U. S. Rubber Co. charging infringement of tubeless tire patents was dismissed on December 12 in the United States District Court in Baltimore, Md. An 83-page opinion handed down by Judge R. Dorsey Watkins ruled that the type of tubeless tire manufactured by U. S. Rubber did not use Goodrich's type of sealing ribs or specific liners and therefore avoided patent infringement.

Goodrich filed the action charging U. S. Rubber with infringement of patent rights on June 29, 1954. The company asked for an injunction restraining U. S. Rubber from further alleged infringements and for a "reasonable royalty" on the tubeless tires U. S. Rubber has made in the last few years.

The suit was the first major court action involving patents to be filed in the tire industry in more than 20 years. Goodrich based its claim on a series of patents obtained from the U. S. Patent Office on various features of its tubeless tire. Three patents were granted in February, 1952, and since then nine others have been granted, making 12 in all. Development of a tubeless tire was disclosed by Goodrich in May, 1947, and sale of the product began in early 1948.

### *Role of Herzegh Invention*

Specifically, the suit dealt with the Frank Herzegh invention of the mid-40's. Goodrich applied for a patent on Mr. Herzegh's invention on December 14, 1946 and it was granted on February 26, 1952. Two of its provisions were the points of contention: a specially compounded rubber inner liner for the tire, and the ribs which seal it to the rim.

During the proceedings, Goodrich attorneys stated that while sealing ribs and liners developed by Goodrich under the Herzegh patent and first put on the market in 1948 were not new, a combination of the two was a new, original and vital contribution to the development of tires.

In rebuttal, attorneys for U. S. Rubber argued that the Herzegh patent was vague and indefinite and disputed the Goodrich contention that the patent was original. It was stated that the use of sealing ribs and liners in combination had been suggested by dozens of people.

In holding Goodrich's patent claims invalid, Judge Watkins placed primary reliance upon the disclosure of prior patents in this field. The court found particularly pertinent the British Killen patent issued in 1930 and the Wingfoot patent issued in South Africa in 1944. He said they indicated tire structures substantially identical to Goodrich's tubeless tire patent.

The court said that the Goodrich tubeless tire had a butyl-type rubber composition covering 100% of the inner surface of the tire. U. S. Rubber's tires, however, have liners that cover 95 to 97% of the inner surface, with the remaining 3 to 5% covered by natural rubber stock.

"This obviously is not a literal infringement," Judge Watkins said. The court also found "as a fact that the liner used in defendant's (U. S. Rubber) tubeless tire is not a liner of 'butyl-type rubber composition' as that language is employed by Goodrich.

"The omission from (U. S. Rubber's) tubeless tire of the sealing ribs, or specific liner, or specific extent and termination of the liner (used by Goodrich) would avoid infringement."

Judge Watkins said he could not go along with Goodrich's argument that even though the liners of the Goodrich and U. S. Rubber tubeless tires were not precisely similar, the end result was the same, and that, in effect, would constitute patent infringement.

Goodrich contends, he said, "that where 97% of the inner surface of the tire is covered solely with butyl material and the remaining 3% solely with natural rubber . . . . stock, the total diffusion rate for the entire inner surface would be the same as if the two rubbers were intermingled and the whole homogeneous mass used to line the entire inner surface of the tire. This was and is incomprehensible to the court.

"A roof with a surface of 100 square feet certainly does not afford the same defense to permeation by the elements if it has three square feet completely uncovered and the remaining 97 square feet covered by slates one inch thick, than it would have if the entire area were covered by slates each 0.97 inch thick. A new pair of trousers from which moths have eaten three per cent is not (regardless of the locale of the depredations) the same as a pair with an over-all wear of 3%. The court, therefore, finds as a fact that the extent and termination of the liner (in Goodrich's tires) is not found in (U. S. Rubber's) tires."

### *Discusses Outcome of Suit*

U. S. Rubber's president, H. E. Humphreys, in discussing the outcome of the suit, said that the company's management was glad to learn that the organization's position had been upheld. He said "We feel that his decision, (Judge Watkins) based on the facts, is in the best interests of the tire manufacturing industry, and—what is more important—the consuming public."

Spokesmen for Goodrich said that the decision was "disappointing not only to B. F. Goodrich but to all industry research effort and expenditure." Goodrich has already announced that it will appeal the decision of the U. S. District Court. The appeal will be filed in the U. S. Circuit Court of Appeals, Richmond, Va.

A similar suit, which had been brought by Goodrich against the Firestone Tire and Rubber Co., is pending in Cleveland Federal Court.

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### QM Advisory Committee Meets

The Industry Advisory Committee to the Quartermaster General on Rubber Heels and Soles met on November 28 at the Quartermaster Research and Development Command, Natick, Mass. The first item presented for discussion concerned non-marking, black, composition rubber heels which were recently included in procurements of Service Combat Boots and Low Quarter Oxford Shoes. It was recommended by the Committee that an abrasion index of 45 for lot average with a minimum figure of 40 was preferable to a minimum of 45, as presently specified.

With respect to inclusion of a new class of non-marking black composition rubber outsoles in Federal Specification ZZ-S-00555, Soles; Shoe, Rubber, Composition, it was recommended that the abrasive index for lot average should be 50 with a minimum figure of 45. It was further recommended that the hardness index before aging should be 72-85 with 72-90 hardness after aging. In addition, it was suggested that the flex growth be set at a figure of 500% at 25,000 flexes.

The next item pertained to the type of rubber compounds and bonding agents used in conjunction with direct molding, wherein composition rubber outsoles and heels are applied by vulcanization to leather shoe uppers. This brought forth some interesting comments and suggestions, all of which will receive careful study. The last item on the agenda related to the problem of secure attachment of lug heels on the Tropical Combat Boot. Several suggestions were offered by the Committee members. Among these, was the possible utilization of a wood core in both the 13 nail whole heel and the 9 nail lug heel. This suggestion, together with others, will be further studied.

### Non-Flammable Contact Cement

Chemical Division of the Borden Co., New York, N. Y., has announced the development of a fire and explosion proof contact cement called "Elmer's Non-Flammable Contact Cement" to be used with "Elmer's Non-Flammable Cleaner & Thinner" as the required solvent. According to the company, use of this product eliminates all danger of explosion and combustibility. Elmer's Non-Flammable Contact Cement can be applied vertically or horizontally with a brush or metal spreader. Its applications include the bonding of synthetic rubber, plastic, leather, linoleum and thin gauge metal to plywood, pressed wood and other porous surfaces. It is said to be especially adapted to the installation of formica or micarta tops on kitchen cabinets, counters, tables, bars and similar items. The product is available in quart and gallon containers.

### Boston Holds Xmas Party

Over 600 members and guests attended the Annual Christmas Party of the Boston Rubber Group which was held on December 14 at the Somerset Hotel in Boston, Mass. A cocktail hour was followed by the serving of a gala dinner. After dinner, members and guests enjoyed an excellent floor show and a drawing for prizes.

## ADVISORY GROUP ACTIVITIES UNDER SCRUTINY BY CONGRESS

Reports from Washington state that Congressional investigators have begun a preliminary investigation into the activities of the Rubber Business Advisory Committee which advises the government on rubber policies, particularly stockpiling. There is said to be a distinct possibility that an official investigation may be opened as a result of a split among committee members at a recent meeting at which the principal issue being discussed was whether the government should change its stockpile policy.

Under current practice, the General Services Administration rotates about 7,500 tons of rubber a month from the government stockpile to insure a continuous fresh supply. Industry is required to deliver replacement rubber to the stockpile within 60 days. The rubber manufacturers put forth a plan increasing this time to as much as 180 days. Rubber dealers, however, generally opposed this plan.

The Rubber Industry Advisory Committee is composed of eighteen members, nine representing manufacturers and nine representing rubber dealers. When the time for a vote came on the stockpile question, the nine manufacturing representatives voted to increase the time to 180 days, and the dealers voted against the plan. The Defense Material Service finally resolved the issue by voting against the plan.

The House Committee on Government Operations which has expressed interest in the activities of all advisory committees is not essentially interested in the final decision in the aforementioned case. It is, however, interested in the fact that each group apparently voted to protect its own interests. It is reported that another reason for the Congressional committee's interest lies in the fact that GSA, the responsible agency, did not tell Congress about the existence of the Rubber Business Advisory Committee.

The House Committee has gone to some pains to try to get all the information it could about the various advisory committees to the government of which there are literally thousands. Over a three-year period, Congressional investigators have asked government agencies to submit certain information on each advisory group. It is now said that GSA failed to file the information on the rubber advisory committee, and the Congressional investigators want to know the reason. Unofficially, GSA officials say that the group was not listed because it was not active at the time the survey was being conducted.

### Purchases Electric Manufacturing

American Hard Rubber Co., New York, N. Y., has announced the purchase of the capital stock of the Electric Manufacturing Co., Inc., of San Francisco, Calif. Electric Manufacturing, which was purchased for cash and stock, will be operated as a wholly owned subsidiary. E. L. Danielson, president, and Floyd Dofsen, vice-president of Electric, inventors of many multicolor molding processes, will continue in their present posts, according to V. T. Norton, president of American Hard Rubber.

## SEVERAL NEW SALES APPOINTMENTS ANNOUNCED BY ENJAY COMPANY

J. P. Haworth

H. C. Evans

Enjay Co., Inc., New York, N. Y., has announced the appointment of J. P. Haworth, formerly assistant sales manager of the Butyl Division, as manager of the newly established Eastern Sales Division, and H. C. Evans, who opened the company's Akron offices in 1955, as Akron district manager. Mr. Haworth will be responsible for the operation of the company's field sales personnel in a nineteen-state area, which includes New England, the Eastern Seaboard States, West Virginia, Ohio and Michigan. He joined Enjay early in 1955 after fifteen years with the Esso Research and Engineering Co. Mr. Evans, who will report to Mr. Haworth, will be responsible for Enjay sales activities in Ohio and adjacent territories in Michigan, western New York, western Pennsylvania and West Virginia. Mr. Evans, who had been associated with the chemical-products operations of Esso Standard Oil Co. at the company's Bayway and Baton Rouge Refineries, joined Enjay in 1947. He opened Enjay's Tulsa offices in 1954 and served there until transferred to Ohio in 1955. In other recent personnel moves, Enjay named W. H. Peterson, butyl sales manager; P. C. Richards, sales manager of the Alcohols and Chemicals Division and K. J. Nelson, manager of a new Special Accounts Division. The new Special Accounts Division will handle long-term contracts or agreements with major chemical firms for products used as chemical raw materials.

### New Polyurethane Foam System

Chase Chemical Corp., Pittsburgh, Penna., has announced the development of a two component system for producing "Nafil" polyurethane foams that will foam, set and cure very quickly without external heat or pressure. According to the company, foam obtained by mixing "Nafil AR Resin" and "HM Catalyst" sets and cures faster than standard Nafil foams. A two-pound per cubic foot foam obtained by using these products will set in five minutes and cure in ten minutes at room temperature, producing a rigid, essentially closed cell foam that has extremely strong, tough cell walls, the company states. Densities of two to twenty pounds per cubic foot can be obtained, the company says. Nafil AR Resin and HM Catalyst were developed to produce a foam with outstanding physical properties that would set and cure at room temperature fast enough to be removed from a mold and handled, coated and packaged ten minutes after pouring without rupturing the cells or damaging or deforming the foam, the company states. The new Nafil foam is particularly suited for molding or casting on a production line, Chase Chemical claims. Nafil AR Resin and HM Catalyst can be mixed by hand or machine and applied by spraying or pouring.

### Wagner Promoted by Witco

Dr. Edward F. Wagner, formerly director of the technical service laboratory of the Witco Chemical Co., New York, N. Y., has been promoted to manager of development, a newly created position. Dr. Wagner will develop and carry out an over-all program designed to broaden the manufacturing activities of Witco and its wholly owned subsidiaries: Emulsol Chemical Corp., Chicago, Ill., and Ultra Chemical Works, Paterson, N. J. A development committee has also been organized with Dr. Wagner as chairman. Other members are: Dr. M. M. Gladstone, manager of technical service for Emulsol, and Albert Sharphouse, executive vice-president of Ultra Chemical. Dr. Wagner received his doctorate from the Illinois Institute of Technology.

### Roth Joins Swan Rubber

Leo Roth has been named manager of product development and quality control for the Rubber Hose and Extruded Products Division of the Swan Rubber Co., Bucyrus, Ohio. Previous to this appointment, Mr. Roth was associated with the Gates Rubber Co. for seven years, where he served in various technical capacities.

## RMA FORESEES CONTINUANCE OF GOOD BUSINESS FOR 1957

In terms of rubber consumption, its best yardstick of activity, the rubber manufacturing industry in the United States will make 1956 its second biggest year in history, the Rubber Manufacturers Association states. The outlook for 1957 is even better, RMA states, with industry economists estimating that the use of new rubber over the next twelve months will approach the record consumption level of 1955.

In its annual round-up of activity in the many product divisions of the industry, RMA estimated that 1956 consumption would total 1,435,000 long tons of new rubber when final figures are all in. This compares with 1,529,699 long tons in 1955. Estimates are that 1957 consumption will reach 1,510,000 long tons.

RMA President Ross R. Ormsby noted that although tire sales declined about nine per cent in 1956, the industry's total volume of business for the year equaled the $5.5 billion sales record reached in 1955. He said this reflected the vigor of the non-tire segments of the rubber manufacturing industry which have shown a strong growth record since World War II. Consuming only about 38 per cent of the new rubber used by the industry, the manufacturers of more than 35,000 non-tire rubber products accounted for upwards of 51 per cent of the total dollar volume.

### *Non-Tire Rubber Consumption*

Out of the 38 per cent of non-tire new rubber consumed, manufacturers of mechanical and industrial rubber goods used about 10 per cent, latex foam production approximately 6 per cent. Of the other non-tire products, shoe products, athletic goods, toys, stationers' products, sponge rubber items, insulated wire and cable, rubber footwear, proofed goods, hard rubber products, flooring, cements, drug sundries and miscellaneous items, account for 22 per cent. All of these divisions generally shared the growth enjoyed by this non-tire product segment of the industry in 1956.

Coupled with increased new rubber consumption expected in 1957, Mr. Ormsby noted the estimates of tire industry leaders indicate that the tire industry would register production gains of six percent or more over the next 12 months. He said the strong 1956 market for replacement tires had been an important factor in offsetting the decline in shipments of original equipment tires for the automotive industry this year. Passenger car replacement tire shipments at 52,000,000 units was up four per cent from 1955. Table I shows the actual production of passenger car, truck and bus, and agricultural implement tires for 1955 and the industry's estimate for 1956.

TABLE I—RMA BREAKDOWN OF TIRE PRODUCTION BY TYPE

| | 1954 | 1955 | 1956* |
|---|---|---|---|
| Passenger & Motorcycle | 76,858,000 | 97,200,000 | 85,517,000 |
| Truck-Bus | 12,347,000 | 14,950,000 | 14,946,000 |
| Farm Tractor Implement | 3,000,000 | 3,800,000 | 2,988,000 |
| Total | 92,205,000 | 115,950,000 | 103,451,000 |

*Estimated

RMA observes that based upon estimates of leaders in the tire industry, 1957 tire production should exceed 110,000,000 units. On the side of new rubber consumption, Table II portrays the actual figures for 1955 and the estimates of the association's Statistical Committee for 1956 and 1957.

The association recently made public a study indicating U. S. consumption of new rubber would exceed 1,600,000 long tons annually by 1960. By that time it is estimated that the potential capacity for the production of all types of synthetic rubber in the United States will exceed the tonnage of new rubber consumption in this country. The U. S. A. ratio of synthetic rubber use to total new rubber consumption continued to climb in 1956. In 1955 it was synthetic 58.50 per cent, natural 41.50 per cent; in 1956, synthetic was 60.9 per cent, natural 39.1 per cent. The synthetic use ratio is expected by some in the industry to reach or exceed 62 per cent in 1957.

For the past several weeks, the per pound price of natural rubber, on the basis of RMA No. 1 Ribbed Smoked Sheets, has averaged from 12 to 14 cents higher than domestically produced synthetic rubber. Mr. Ormsby observed that the sharp price differential coupled with shipping uncertainties attending the Middle East crisis had served to sharpen incentives to expand synthetic rubber research and use. This applies, he said, both to the search for new means of reducing production costs and the development of new and better polymers to join the family of many hundreds of synthetic rubber types evolved in the last 15 years.

### *Synthetic "Natural" Rubbers*

Mr. Ormsby said that the entire industry was looking to 1957 as the year in which it could begin wide-scale evaluation of the very promising synthetic "natural rubbers" unveiled by several firms in the past year.

Both price advantage and quality characteristics of synthetic rubbers are believed by the industry to be important factors in the sharp rise of U. S. exports of synthetic rubber. Mr. Ormsby pointed to a 400 per cent increase in the export of man-made rubbers between 1954 and 1956. In the earlier year, the United States exported 30,486 long tons of synthetic rubber. Exports jumped to 93,365 L.T. in 1955. It is estimated that exports will top 150,000 L.T. in 1956, the association executive said.

The RMA Crude Rubber Committee obtained the endorsement late in 1956 by 23 rubber producing, packing, trading and manufacturing associations throughout the world of its new set of international standards for natural rubber. Known as "Type Descriptions and Packing Specifications of Natural Rubber Grades Used In International Trade", this document is now in printing. It will be mailed within the next few weeks to become effective in world rubber trade early in 1957.

Factory employment in the rubber manufacturing industry averaged 217,700 production and maintenance employees for the first nine months of 1956 as compared with 213,200 for the same period in 1955.

TABLE II—CONSUMPTION OF NEW AND RECLAIMED RUBBER

| | 1955 | 1956 | 1957* |
|---|---|---|---|
| New Rubber | 1,529,699 | 1,435,000 | 1,510,000 |
| Reclaimed Rubber | 312,781 | 273,000 | 302,000 |

*Estimated

## Free Radicals Symposium Planned

A three-day Symposium on the Formation and Stabilization of Free Radicals, sponsored by the Applied Physics Laboratory of Johns Hopkins University, Catholic University of America, and the National Bureau of Standards, will be held at the National Bureau of Standards on September 18 to 20, 1957. This conference is expected to provide a medium for exchange of information on isolation and study of free radicals, which are currently under study by a number of industrial, government and university laboratories due to recent advances in low-temperature physics, high polymer research and other fields. Arrangements are being made by an executive committee composed of Dr. F. O. Rice (Catholic University), Dr. S. N. Foner (Applied Physics Laboratory), Miss Akrevy Pappas (NBS), and Dr. A. M. Bass (NBS). Further information on the program may be obtained from Dr. A. M. Bass, Free Radicals Research Section, National Bureau of Standards, U. S. Department of Commerce, Washington 25, D. C.

## Liberian Operation Cited

A report on benefits derived by Liberia from operations of the Firestone Tire and Rubber Co. in that country has been released by the National Planning Association of Washington, D. C. It was the fifth in the association's studies of "United States Business Performance Abroad." In thirty years of Liberian operations, the study recounts, Firestone has combined profitable business with policies contributing substantially to living, health and housing standards and broad development of the host country. The association's series seeks, through studies of companies that have gained profit and popularity abroad, to develop guides for new American foreign enterprises.

## RUBBER & PLASTICS AGE PLANS SYNTHETIC RUBBER SYMPOSIUM

An International Symposium on Synthetic Rubber to be held at Church House, Westminster, London, S.W.1, England on March 26 to 28 has been announced by *Rubber and Plastics Age (London)*. In announcing the symposium, the English publication points out that ever since the war the British manufacturing industry has been forced to rely largely on natural rubber as its main raw material. During this time, its competitors in other countries were using new and improved synthetics.

While facilities for the manufacture of synthetic rubber are now being built in Great Britain, these plants are not yet in full production. Meanwhile, the government has authorized the importation of up to 80,000 tons of synthetic rubber per year. The purpose of the symposium is to gather together information on the latest types of rubbers under development and to suggest new uses for these materials.

G. E. Beharrell, chairman of the International Synthetic Rubber Co. and vice-chairman and managing director of Dunlop Rubber Co., Ltd., is serving as chairman of the symposium. The three-day program will include a number of papers by experts in the field. The following papers are scheduled for presentation at the symposium:

"Ameripol SN Rubber" by R. P. Kenny, B. F. Goodrich Chemical Co.

"Auxiliary Materials for Synthetic Rubber" by Dr. W. McG. Morgan, Monsanto Chemicals Ltd.

"British Developments in Synthetic Rubber" by E. A. Murphy, Dunlop Research Centre.

"Butadiene-Vinyl Pyridene Copolymers" by Dr. W. Gumlich, Chemische Werke Hüls AG.

"Butyl Rubber—General" (Part I) by W. C. Smith, W. L. Dunkle, R. L. Zapp, Enjay Laboratories, and "Butyl Rubber—Tires" (Part II) by D. J. Buckley, Esso Research & Engineering Co.

"Effect of Cis-Trans Ratio on the Physical Properties of 1,4- Polybutadienes" by J. N. Short, Vernon Thornton, Gerard Kraus, Phillips Petroleum Co.

"German Synthetic Rubber Developments" by Prof. Dr. Paul Baumann, Chemische Werke Hüls AG.

"Neoprene Latices" by E. P. Hartsfield, E. I. du Pont de Nemours & Co., Inc.

"Nitrile and Other Acrylic Rubbers" by S. Mottram and P. H. Starmer, British Geon, Ltd.

"Organic Fluorine Rubbers" by Dr. J. C. Tatlow, University of Birmingham.

"Self-Reinforcing Elastomers" by Polymer Corp.

"Silicone Rubber—Its Growth and Recent Developments" by Phillip C. Servais, Dow Corning Corp., Midland Silicones Ltd.

### Joins General Magnesite

General Magnesite and Magnesia Co., Plymouth Meeting, Penna., has announced that Harold D. Dietrich, formerly associated with the Celanese Corp. and with Boston Woven Hose and Rubber Co., has joined the company as sales representative for the east coast.

## DUPONT ELASTOMER CHEMICALS DEPARTMENT ANNOUNCES APPOINTMENTS

C. J. Harrington

M. H. Campbell

Elastomer Chemicals Department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has announced the appointment of Dr. Charles J. Harrington as director of sales and Milton H. Campbell as assistant director of sales. Dr. Harrington joined DuPont as a chemist in the Jackson Laboratory of the Organic Chemicals Department following his graduation from Princeton University in 1933. A year later, he attended Massachusetts Institute of Technology and received a doctor of science degree in chemical engineering. He returned to Jackson Laboratory spending several years there and in the industrial engineering division of the Engineering Department.

In 1942, Dr. Harrington joined the staff of the new neoprene plant at Louisville as an area supervisor. During the war, he served at the Hanford Engineer Works, the World War II plutonium plant which DuPont built and operated for the government. He returned to Louisville in 1945 and since then has been manager of the European office of the Foreign Relations Department, London; assistant director of the Secretary's Department; and then assistant director of sales, Elastomers Division, Organic Chemicals Department.

Mr. Campbell joined DuPont in 1947 as an automotive engineer. In 1950, he became director of the Petroleum Laboratory and division head of the Jackson Laboratory in 1951. In 1953, he became assistant director of sales in the Petroleum Chemicals Division. He was named assistant sales manager of isocyanates in the Elastomers Division in July, 1955.

Other assignments in the sales division of the new Elastomers Chemicals Department are essentially the same as those in the Elastomers Division of the Organic Chemicals Department. Herman H. Abernathy is sales manager, development; William H. Ayscue is sales manager, isocyanates; Carl A. Bartle, rubber chemicals; H. Logan Lawrence, neoprene and Hypalon; Vaile A. Cosler, promotion. Harry G. Bimmerman is director of the Elastomers Laboratory. Emil H. Krismann remains district sales manager at Akron; Russell A. Kurtz, Chicago; Samuel W. McCune, III, Eastern District, Trenton; W. H. Zillessen, New England District, Boston; and A. J. Mease, Los Angeles.

### Establishes New Sales Districts

Silicone Products Department of General Electric Co., Waterford, N. Y., has announced the reorganization of its sales force and the creation of two new sales districts. According to the company, the reorganization was necessitated by continued growth in silicone sales and the increasing variety of commercially available silicone products of all kinds. Sales districts formed were the Chicago sales district, to be managed by Milton C. Lauenstein, and the Western sales district, headquartered at Los Angeles under Robert T. Daily. Mr. Lauenstein, who received his chemical engineering degree from Purdue University in 1945, joined the Silicone Products Department in 1951. Previous to this, he had been employed at the Norton Co. Mr. Daily, transferred to his new post from the department's Dallas office. Formerly sales manager at the Lord Manufacturing Co., he joined General Electric in 1954.

### Materials Handling Show Planned

The Seventh National Materials Handling Exposition will be held at Convention Hall, Philadelphia, Penna., April 29 through May 3, exposition management, Clapp & Poliak, Inc., New York, N. Y., has announced. Simultaneously, the American Materials Handling Society, whose membership consists of executives of firms using various types of materials handling equipment, will conduct a conference to discuss new developments in handling methods. The Society's annual banquet will be held at this time and honors and awards will be presented. Theme for the 1957 show will be "Materials Handling, Key to Automation". According to Clapp & Poliak, over 100 different types of materials handling equipment will be demonstrated and more than 250 companies are expected to participate. Advance registration cards may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

# SIGNAL CORPS LABORATORIES SPONSOR WIRE AND CABLE SYMPOSIUM

The Fifth Annual Symposium on "Technical Progress in Communication Wires and Cables," sponsored jointly by the Signal Corps Engineering Laboratories, Fort Monmouth, N. J., and the industry, was held on December 4 to 6 at the Berkeley-Carteret Hotel in Asbury Park, N. J., with approximately 750 in attendance. The symposium was held under the auspices of the Telecommunications Division of the Laboratories.

Morning and afternoon technical sessions were held on December 4 and 5 and the technical program was concluded with the morning session on December 6. A "hospitality hour" was held at 5:30 P.M. on December 4 and a banquet at 8:00 P.M. on December 5. Howard L. Kitts (SCEL) served as chairman of the Symposium Committee and H. F. X. Kingsley (SCEL) served as co-chairman. Other committee members included: R. Blain (Army Signal Communication Engineering Agency), C. T. Wyman (Bell Telephone Labs), B. Jore (Anaconda Wire), E. J. Burrough (DuPont), V. McBride (Plastic Wire), and G. Hamburger (Copperweld Steel).

A considerable number of interesting papers were presented at the symposium. One of these was "Kel-F 500—A New Fluorocarbon Insulating Material" by J. A. Jupa (M. W. Kellogg). In his talk, Mr. Jupa stated that Kel-F 500 retains the same extreme chemical resistance, low temperature flexibility, outstanding electrical characteristics, zero moisture absorption, high mechanical and physical properties, and abrasion resistance as the 270 and 300 grades. Kel-F 500-F also offers higher continuous heat aging resistance—up to temperatures of 150° to 175°F., greater flexibility and improved resistance to radiation.

### *Hypalon Wire Coverings*

Another of the papers presented at the symposium was "Properties of Hypalon Wire Coverings" by F. Wayne Keeley (DuPont). The author stated that it was evident from the test data that Hypalon wire coverings have exceptional electrical and physical stability under the many types of severe exposure conditions that can be encountered in wire and cable installations. Because of this, he said, it is expected that it will find many applications in the manufacture of wire and cable.

"Resistance of Rubber Covered Cable, Jacket, and Insulation Stocks to Weather and Artificial Aging" was the title of a paper presented at the symposium by J. W. Bryden, F. Ruppert, M. Smith and P. Mitton (Engineer Research and Development Labs). The authors noted that by the use of four parts of wax, GR-S type rubber can be compounded to experience practically no weather cracking when exposed unstressed for two years. GR-S can be so compounded as to undergo very limited weather cracking when exposed under stress for 24 months. However, the use of wax in itself is not adequate to insure this characteristic. Differences in types of wax, in compounding materials, and in methods of mixing and curing permit a wide range of results. The suitability of a specific type of rubber or formulation can be determined only by test.

The authors stated that it has been demonstrated that low temperature properties of military cables can be retained after exposure to desert conditions. A general correlation between tensile strength retention after exposure and weather cracking has been indicated. It was noted that the weatherometer caused significant weathering of the several cable materials tested, but the results differed markedly from those obtained in outdoor exposure. The ozone chamber, on the other hand, provides a more satisfactory method for predicting weather resistance.

G. N. Vacca (Bell Telephone Labs), for his part in the symposium, presented a paper on "Aging of Neoprene in a Weatherometer". Mr. Vacca's paper reported the results of an investigation into the effect of comparatively long exposure of neoprene jackets in an accelerated weathering device. The author observed that a weatherometer, such as the specific unit used in the tests, did not contribute materially to the estimation of expected outdoor service life of neoprene jackets. An accelerated ozone test in conjunction with a 100°C. air oven test will, Mr. Vacca stated, give a reliable criterion of expected service life in a relatively short time.

An interesting paper on "The Effect of Carbon Black Surface Properties on the Stability of Polyethylene" by J. T. Moynihan (Acheson Dispersed Pigments) was also presented at the symposium. It was stated that carbon black has been found to be the most effective stabilizer for polyethylene with respect to degradation due to light and weathering. One obvious characteristic of carbon black as a light stabilizer in polyethylene is that it absorbs light throughout the entire range of the spectrum and so protects the interior of the plastic into which it has been incorporated from the penetration of high energy photons.

In a paper on "New Developments in Cable Jacketing Compounds", D. W. Dahringer and W. T. Higgins (Bakelite) discussed Bakelite NFD-3000, an internally plasticized vinyl chloride material which possesses adequate flexibility without the use of plasticizers or other modifiers. It was shown that NFD-3000 is suitable for non-migratory cable jackets under pertinent military specifications.

### *Silicone Rubber Compounds*

"New Developments in Silicone Rubber Compounds for Extruded Electrical Insulation" was the title of the paper presented at the symposium by M. G. Noble (G-E). The author outlined recent developments in silicone rubber technology, and described certain areas in which the material is finding current use. Mr. Noble noted that while silicone rubber is not the "all purpose" insulation the wire industry is seeking, it is finding increasing acceptance as an insulation material.

Another paper on the subject of silicone rubber compounds was presented by J. S. Hurley, Jr. (G-E) Mr. Hurley, in his paper on "New Developments in Silicone Rubber for Electrical Tapes", discussed the silicone rubbers in relation to the electrical industry, giving an analysis of their physical properties and the results of studies testing their suitability in this field. He concluded by listing specific advantages of the silicone rubbers to the cable engineer.

E. W. Cronin, J. B. Martin and W. O. Bracken (Hercules Powder) presented a progress report at the symposium on "Hi-fax" linear polyethylene polymers and their applicability to the wire and cable industry. Entitled "Hi-fax Potentials in the Wire and Cable Industry", the paper notes that the material, with its electrical characteristics and its resistance to heat, abrasion, cut-through and stress corrosion, has properties which will be utilized in both the communication and power cable fields.

"Some Considerations on the Use of High Density Polythene in the Cable Industry", was the title of the paper presented by D. Grant (ICI-England). This paper analyzed the high density polyethylenes and their applicability to the manufacture of cable. The author stated that this material is immediately attractive to the cable manufacturer but has some defects which become evident under the stringent conditions of accelerated tests.

### *Polyethylene Irradiation*

In his paper on "The Effect of Radiation on Polyethylene", V. L. Lanza (Bell Telephone Labs) stated that it is possible, by a judicious selection of irradiation dose, to effect a marked increase in the tensile strength of a standard or even a lower molecular weight polyethylene without any significant loss in elongation. Other benefits which can be derived from irradiation include crack resistance, improved weathering, etc.

"The Use of Irrathene Irradiated Polyethylene in Wire and Cable" by Dr. K. J. MacKenzie (G-E), discussed recent developments in the field of irradiated polyethylene and the use of these materials in some typical wire and cable applications.

W. Hopper (Dupont) in his paper on "A Practical Approach to the Extrusion of Thermoplastics", discussed the typical extruder and outlined methods to quickly gauge the efficiency of the extruder's operation and to locate the source of any irregularities which may occur.

This question of extruder performance was also discussed at the symposium by B. H. Maddock (Bakelite) in his paper on "How to Predict Extruder Performance". The author pointed out that fundamental theories of flow in single screw extruders have been developed and published by a number of observers. It was noted, however, that these theories always presupposed ideal conditions which almost never exist in practice. This paper, then, attempted to apply the theoretical equations to practical situations by considering additional information, such as the physical condition and effective viscosity of the material in the screw channel. Such additional information was developed for polyethylene, and the author showed how this information can be used to predict extruder performance.

## ACS RUBBER DIVISION PLANS SPRING MEETING IN MONTREAL

The Spring meeting of the Division of Rubber Chemistry, American Chemical Society, will be held jointly with the meeting of the Rubber Division of the Chemical Institute of Canada from May 15 to 17 at the Sheraton Mt. Royal Hotel in Montreal, Que., Canada. Chairman of the Local Arrangements Committee is O. R. Huggenberger (Dominion Rubber). The first technical session, which will be preceded by a regular meeting of the 25-Year Club will start at 2:00 P.M. on Wednesday, May 15, with Chairman B. S. Garvey, Jr. (Sharples Chemicals) presiding. Rubber Division members are requested to submit papers considered to be worthy of presentation. Those who plan to deliver papers should submit abstracts of about 200 words, in quadruplicate, to the secretary (A. M. Neal, E. I. du Pont de Nemours & Co., Inc., P. O. Box 406, Wilmington, Del.), on or before March 15. The letter of transmittal should give the following information: (1) the laboratory in which the work was done, (2) the name of the person who will deliver the paper, (3) amount of time requested for presentation of the paper.

If the authors are engineers or chemical engineers residing in the United States, at least one of them must be a member of the ACS. Papers to be presented by authors residing in the United States, other than graduate chemists or chemical engineers, should submit along with their abstracts, evidence that the proposed authors are ineligible for membership in the ACS. At the meeting, four copies of the finished papers are to be handed to the secretary. Nominations for the recipient of the Charles Goodyear Medal will be considered at the Montreal meeting. According to Division by-laws, any member of the Division is entitled to send nominations to the secretary or to A. E. Juve (Goodrich), chairman of the Charles Goodyear Committee. The nomination should contain a statement of the contributions of the candidate, a general statement concerning the importance of his contributions, a list of his pertinent publications and a brief biography.

A Local Arrangements Committee has been named for the Joint Meeting of the Division of Rubber Chemistry of the American Chemical Society and the Rubber Division of the Chemical Institute of Canada. O. R. Huggenberger (Dominion Rubber) has been named chairman of the Local Arrangements Committee with J. L. MacDonald (DuPont-Canada) as co-chairman and secretary. Other functions will be handled by the following: *Banquet*, Q. R. Ball (Northern Electric); *Financial*, H. Hencher (H. L. Blachford); *Housing*, E. B. Bibby (Harrisons & Crosfield); *Ladies' Program*, A. W. Bell (St. Lawrence Chemical); *Program and Meeting Room*, E. A. MacKenzie (Pirelli); *Publicity*, A. B. Lewis (British Rubber); *Registration*, W. R. Blundell (Dominion Rubber), and *Special Events*, W. Edward (Caledonia).

**Take issue with something in this edition? Write a letter to the editor! (See page 594).**

## CARPENTER AND VAN VOLKENBURGH JOIN COPOLYMER RESEARCH DIVISION

P. G. Carpenter

R. Van Volkenburgh

Copolymer Rubber and Chemical Corp. of Baton Rouge, La., has announced the appointment of Dr. Paul L. Carpenter as director of research and development in the company's Research Division, and the appointment of Dr. Ross Van Volkenburgh as supervisor in the Division. Dr. Carpenter was born in Salem, Oregon and attended local schools there. After completing undergraduate work at Willamette University in Salem, Oregon, he was awarded an M.A. Degree from Oregon State College in 1937 and the Ph.D. degree in chemistry from the University of Wisconsin in 1941. He was associated with the Hercules Powder Co., Wilmington, Del., as research chemist and research supervisor until 1947. Before joining Copolymer, Dr. Carpenter was manager of the Synthetic Rubber Branch, Research and Development Department of the Phillips Petroleum Co., Bartlesville, Okla. Dr. Van Volkenburgh, formerly supervisor of organic research for the J. M. Huber Corp., New York, N. Y., is a native of Michigan and has spent twelve years in the Texas Panhandle. He attended Michigan State College and received his Ph.D. degree in chemistry from Ohio State College in 1946. He is a member of the American Chemical Society, Alpha Chi Sigma and Sigma Xi.

### Elect Two New Vice-Presidents

Hewitt-Robins Inc., Stamford, Conn., has announced the election of F. L. Griffith and F. W. Blanchard as vice-presidents of the company. Mr. Blanchard will be responsible for manufacturing and engineering in the company's industrial products divisions. He is a native of Pennington, N. J. and received a B.S. degree in engineering from Lehigh University. Mr. Blanchard joined Hewitt-Robins in 1936 as an engineer and draftsman. Since then, he has served as plant engineer, chief engineer, factory manager and manager of operations of the Hewitt Rubber Division's plant at Buffalo, N. Y. During the last six months, he has been serving as assistant to the executive vice-president. A native of Baltimore, Md., Mr. Griffith was graduated from Cornell University with an engineering degree in 1940. He joined Hewitt-Robins in 1949 as supervisor of time study and methods in the foam rubber plant at Buffalo. Later, he became superintendent of the conveyor machinery plant in Passaic, N. J. and in 1952, he organized the company's industrial products central sales department in Stamford. Since 1953, Mr. Griffith has been general sales manager of the industrial products divisions and will continue in that capacity as a vice-president of the company.

### New United Carbon Officers

Directors of the United Carbon Co. of Charleston, West Va., have accepted the resignation of Oscar Nelson, Jr., as executive vice-president. Mr. Nelson was also president of United Carbon's principal operating subsidiaries. T. A. Whelan is president of the United Carbon Co. Grant Thomas has been elected president of the United Carbon Co., Inc., and A. G. Treadgold has been elected president of the United Rubber & Chemical Co. Arthur Hanson has been elected vice-president in charge of finance for the United Carbon Co. and its principal subsidiaries. Mr. Whelan, in addition to serving as president of the United Carbon Co., is also president of the United Producing Co., Inc., the oil and gas subsidiary.

### Pequanoc Rubber Expanding

Pequanoc Rubber Co., Butler, N. J., has announced the acquisition of a 100-acre site in Tallapoosa, Ga., where a new custom-compounding plant will be constructed. Construction began in January and is scheduled for completion in June, 1957. According to company officials, Pequanoc's business has been expanding and the new Tallapoosa plant will provide needed additional capacity.

### Detroit Group Installs Officers

The installation of officers and committee chairmen for the 1957 season featured the Annual Christmas Party of the Detroit Rubber and Plastics Group which was held on December 7 at the Sheraton Cadillac Hotel in Detroit, Mich. Approximately 1,000 members and guests were in attendance and participated in a program consisting of dinner, musical entertainment and a drawing for some 200 prizes. Officers installed at the meeting included: *Chairman*, H. F. Jacober (Baldwin Rubber); *Vice-Chairman*, E. J. Kvet, Jr. (Detroit Arsenal); *Secretary*, S. R. Schaffer (U. S. Rubber); *Treasurer*, W. F. Miller (Yale Rubber Mfg.). The committees and their new chairmen are: *Membership*, W. A. Wiard (Dow Corning); *Educational*, R. W. Malcolmson (DuPont); *Publicity*, S. M. Sidwell (Chrysler); *Program*, W. D. Wilson (R. T. Vanderbilt); *Entertainment*, R. C. Chilton (Permalastic Products). T. W. Halloran (Chemical Products) has been installed as group historian.

### Elected ACS President

The American Chemical Society has named Dr. Clifford F. Rassweiler as president-elect of the society. He is vice-chairman of the board and vice-president for research and development of the Johns Manville Corp. The society's president for 1957 is Professor Roger J. Williams of the University of Texas. He succeeded Dr. J. C. Warner, president of the Carnegie Institute of Technology, who served as ACS president in 1956. Dr. Rassweiler, who is past president of the Industrial Research Institute, was recently awarded the organization's medal.

### Southern Group Plans Meeting

The newly formed Southern Rubber Group will hold its second meeting on February 8 and 9 at the Statler Hilton Hotel in Dallas, Texas. The technical program for the meeting will consist of two panel discussions. On Friday afternoon, February 8, a panel discussion on "Rubber Processing" will cover the following topics: (1) Rubber processing equipment; (2) Banbury mixing; (3) Mill mixing; (4) Extruding, and (5) Calendering. On Saturday morning, February 9, a panel will discuss "Reinforcement of Rubber with Fabrics."

### New York Holds Christmas Party

Approximately 530 members and guests of the New York Rubber Group attended the Annual Christmas Party held on December 14 at the Henry Hudson Hotel in New York City. The festivities got under way with a cocktail party and this was followed by an excellent dinner and a program of entertainment. A drawing for prizes at which more than 110 gifts were distributed concluded the evening. The major prize of the evening, a 14-inch portable television set, was won by Larry Gormally (Monsanto).

**Have some comments to make? Write a letter to the editor! (See page 594).**

## Coming Events in the Rubber Industry

**Jan. 25.** Akron Rubber Group, Symposium, "Physical Testing in the Rubber and Plastic Industries," Sheraton-Mayflower Hotel, Akron, Ohio.

**Jan. 25.** Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

**Feb. 1.** Detroit Rubber & Plastics Group, Detroit-Leland Hotel, Detroit, Mich.

**Feb. 1-3.** Boston Rubber Group, 9th Annual Ski Outing, Bartlett Hotel, Bartlett, N. H.

**Feb. 5.** Los Angeles Rubber Group, Biltmore Hotel, Los Angeles, Calif.

**Feb. 7.** Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

**Feb. 8-9.** Southern Rubber Group, Dallas, Texas.

**Feb. 15.** Chicago Rubber Group, Furniture Mart, Chicago, Ill.

**Feb. 21.** Quebec Rubber & Plastics Group, Ladies' Night.

**Mar. 5.** Los Angeles Rubber Group, Biltmore Hotel, Los Angeles, Calif.

**Mar. 12.** Ontario Rubber Group, C.I.C., Kitchener, Ont.

**Mar. 15.** Chicago Rubber Group, Furniture Mart, Chicago, Ill.

**Mar. 18-21.** Society of the Plastics Industry, Annual National Conference, Los Angeles-Biltmore Hotel, Los Angeles, Calif.

**Mar. 22.** New York Rubber Group, Henry Hudson Hotel, New York, N. Y.

**Apr. 5.** Akron Rubber Group, Spring Meeting, Sheraton-Mayflower Hotel, Akron, Ohio.

**Apr. 9.** Ontario Rubber Group, C.I.C., Toronto, Ont.

**Apr. 11.** Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

**Apr. 12.** Detroit Rubber & Plastics Group, Detroit-Leland Hotel, Detroit, Mich.

**Apr. 18.** Quebec Rubber & Plastics Group.

**Apr. 26.** Chicago Rubber Group, Furniture Mart, Chicago, Ill.

**May 10.** Ontario Rubber Group, C.I.C., Niagara Falls, Ont.

**May 15-17.** Division of Rubber Chemistry, A.C.S., Joint Meeting with Rubber Chemistry Division of C.I.C., Sheraton-Mount Royal Hotel, Montreal, Que., Canada.

**June 7-9.** Los Angeles Rubber Group, Summer Outing, Sahara Hotel, Las Vegas, Nevada.

**June 7.** Fort Wayne Rubber & Plastics Group, Summer Outing, Lake Tippecanoe, Leesburg, Ind.

**June 9-13.** A.S.M.E. Semi-Annual Meeting, Sheraton-Palace San Francisco, Calif.

**June 20.** Quebec Rubber & Plastics Group, Golf Tournament.

**June 21.** Akron Rubber Group, Summer Outing, Firestone Country Club, Akron, Ohio.

**June 28.** Detroit Rubber & Plastics Group, Western Country Club, Detroit, Mich.

**Sept. 11-13.** Division of Rubber Chemistry, A.C.S., Fall Meeting, Hotel Commodore, New York, N. Y.

**Sept. 23-25.** A.S.M.E., Fall Meeting, Hotel Statler, Hartford, Conn.

**Sept. 26.** Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

**Oct. 4.** Detroit Rubber & Plastics Group, Detroit-Leland Hotel, Detroit, Mich.

**Oct. 4.** New York Rubber Group, Henry Hudson Hotel, New York, N. Y.

**Oct. 25.** Akron Rubber Group, Fall Meeting, Sheraton-Mayflower Hotel, Akron, Ohio.

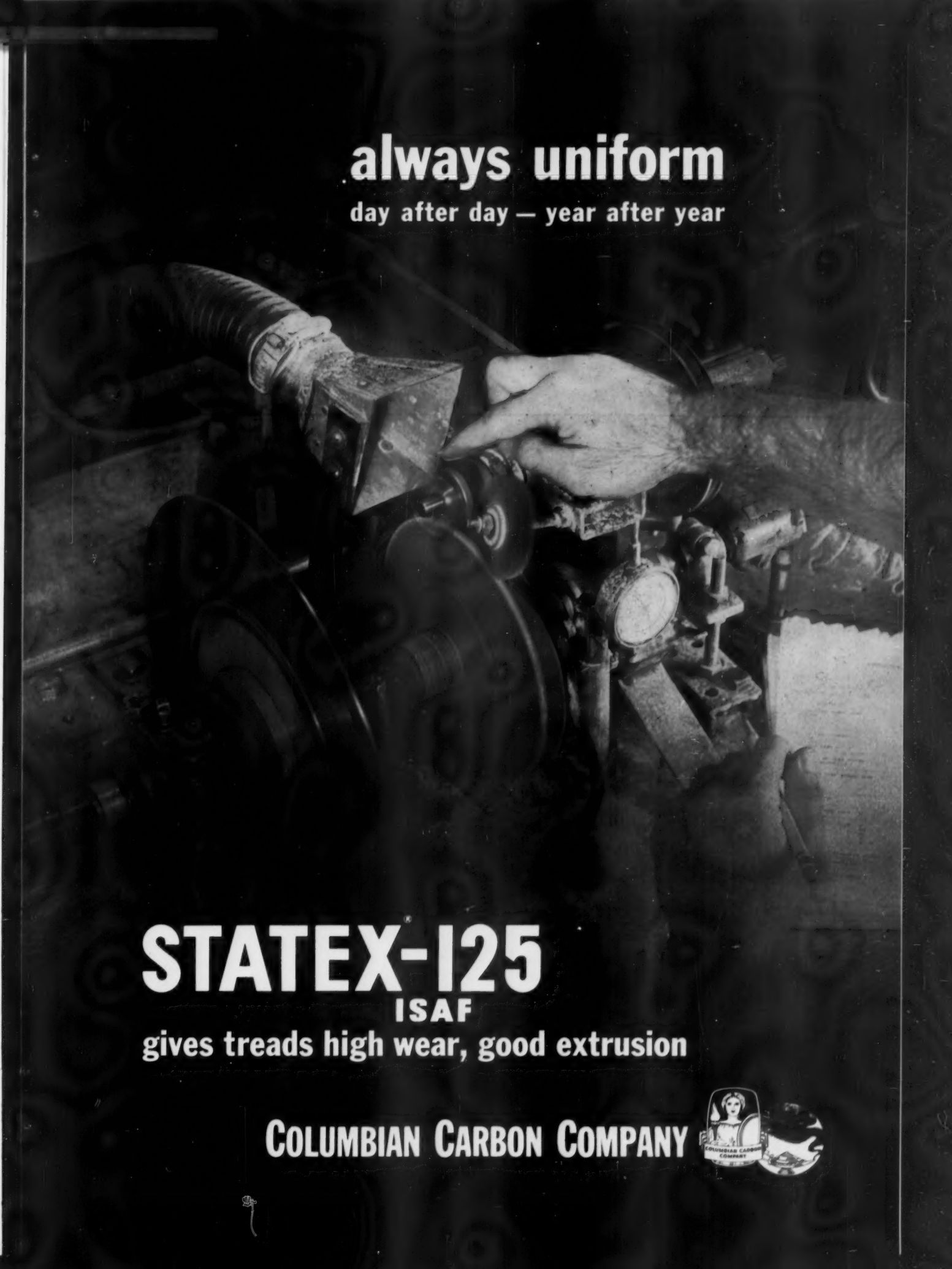
**Dec. 1-6.** A.S.M.E. Annual Meeting, Hotel Statler, New York, N. Y.

**Dec. 5.** Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

**Dec. 6.** Detroit Rubber & Plastics Group, Xmas Party, Sheraton-Cadillac Hotel, Detroit, Mich.

**Dec. 13.** New York Rubber Group, Henry Hudson Hotel, New York, N. Y.

**May 14-16, 1958.** Division of Rubber Chemistry, A.C.S., Spring Meeting, Netherlands Plaza Hotel, Cincinnati, Ohio.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### Ekholm Named To New Post

Wesley C. Ekholm

Columbian Carbon Co., New York, N. Y., has announced the appointment of Wesley C. Ekholm to the newly created post of general manager of manufacturing for the company's Carbon Black and Pigment Division, with headquarters in New York City. Mr. Ekholm, formerly headed Columbian's carbon black production as general manager at Monroe, La., and will be succeeded in this post by M. R. Howell, who has held key positions in Columbian's carbon black production. Mr. Ekholm is an alumnus of Texas Christian University with a B. S. degree in chemical engineering, and Rice Institute, where he received an M. S. in chemistry. He is a member of several honorary socities as well as the American Chemical Society, American Institute of Chemical Engineers and the American Petroleum Institute. Mr. Howell is a graduate of the University of Oklahoma with the degree of B. S. in chemical engineering.

### Improved Urethane Formulation

What is said to be a major advance in the control of fast-reacting urethane used to produce foamed-in-place rigid materials has been reported by the Research Division of the Dayton Rubber Co., Dayton, Ohio. Dayton has developed an improved formulation that slows down normal foam reactions of 30-60 seconds to 100-180 seconds. This affords a safer handling margin and enables pouring into molds before the urethanes harden in the mixing vessels, a major problem up until now. The new formulation is specifically designed for rigid materials used in electronic components for aircraft, guided missiles, etc. In addition to reducing waste, the new formulation gives a more uniform and finer pore structure, the company states. The formulation, a two-component liquid system of polyesters and isocyanates, already has been approved for production by several major electronics manufacturers.

Society of Automotive Engineers has moved its headquarters to 485 Lexington Ave., New York, N. Y. The new phone number is OXford 7-3340.

### Goodyear Arctic Aircraft Tires

Aviation Products Division of the Goodyear Tire and Rubber Co., Akron, Ohio, has announced the development of specially compounded tubeless aircraft tires which have been approved for Arctic operation. The development of these tires, the company said, results from the need for tubeless military aircraft tires able to withstand temperatures of —65°F. and lower. Since the introduction of tubeless aircraft tires more than three years ago, engineers have been working on the problem of perfecting compounds capable of standing up under extremely cold temperatures while maintaining casings in airtight condition. Working with the Wright Air Development Center, the company conducted cold weather tests at its laboratories to supplement Wright's development work. Weather conditions faced by military aircraft in sub-zero climates were duplicated at Goodyear's tire test laboratory with each test casing subject to a 24-hour "soak" in which it was placed in a "cold box" where temperatures were lowered to —65°F. At the desired temperature, the frozen tire was placed on a dynamometer and landed at speeds up to 200 miles per hour to simulate actual aircraft operating conditions. Goodyear is now producing this tubeless aircraft tire in quantity.

### Jackson Forms Consulting Firm

John A. Jackson has opened offices at 117 North Montgomery St. in Trenton, N. J., to offer design service and technical advice on custom molded or extruded applications for rubber and plastic materials. Initially, the firm of John A. Jackson—Consulting Sales Engineers, will serve as mid-eastern representative of Goshen Rubber, Sperry Rubber and Plastics and Syracuse Rubber. These companies recently initiated sales expansion programs in New Jersey, Pennsylvania, Maryland and Delaware. For nine years prior to forming his own organization, Mr. Jackson was sales manager of Stokes Molded Products, a division of the Electric Storage Battery Co. He is a member of the Society of Plastics Engineers, the American Ordnance Association, the American Marketing Association and the National Sales Executives, Inc.

### ASTM Plans Committee Week

American Society for Testing Materials will meet for its Annual Committee Week and Spring Meeting on February 4 through 8 at the Benjamin Franklin Hotel in Philadelphia, Penna. Of the organization's 80 main technical committees, 35 will be in session during the week. Over the five-day period, more than 350 committee and subcommittee meetings will take place. A technical highpoint of the week will be a Symposium on Thermal Conductivity Measurements and Applications of Thermal Insulations which will take place on Wednesday afternoon, February 6. At this writing, subcommittees of Committee D-11 on Rubber and Rubberlike Materials are scheduled to meet on Wednesday and Thursday, February 6 and 7. D-11 itself will meet on Friday, February 8.

### Adamson Joins Goodrich-Gulf

Bo Adamson

Goodrich-Gulf Chemicals, Inc., Cleveland, Ohio, has announced that Bo Adamson has joined the company as sales representative, covering the New England area. His headquarters will be located at the company's main offices in Cleveland. A native of Jamestown, N. Y., Mr. Adamson received a B. S. degree in chemistry in 1950 from Wallace College in Cleveland. From 1942 to 1945, he served with the Air Force. Prior to joining Goodrich-Gulf in August, he served for two years as a sales representative for Harwick Standard Chemical Co., Akron, Ohio. He is a member of the Division of Rubber Chemistry of the American Chemical Society.

### Paruba Roofing Compound

Seaboard Plastics Corp., Irvington, N. J., has announced the development of a unique roofing compound which combines Rubarite, asphalt, latex, asbestos, mica and a stabilizer to form a tough, heat-resistant, non-crackable, waterproof surface over any roof. Called "Paruba", the material is also said to stop water seepage and cause cessation of deterioration. The Rubarite content in Paruba toughens and makes more ductible the asphalt content, the company states, thus insuring longer life and wear. Paruba can be applied easily with a stiff roof brush.

### Merger Agreement Announced

Directors of the American Hard Rubber Co. and the Wardell Corp., both of New York, N. Y., have agreed to a merger. No details were announced except that an exchange of stock will be involved. Stockholders of both companies will vote on the proposal at special meetings to be held at an early date. Wardell, former producer of vacuum cleaners and heating equipment, has not engaged in any business since December, 1953, except to invest in government and other securities.

A four-page illustrated data sheet on its line of dock loading hose for handling gasoline and oil has been published by B. F. Goodrich Industrial Products Co., Akron, Ohio.

## SPI HOLDS SEVENTH ANNUAL PLASTICS FILM AND SHEETING CONFERENCE

Approximately 450 persons were registered for the Seventh Plastics Film, Sheeting and Coated Fabrics Division Conference of the Society of the Plastics Industry, Inc., at the Hotel Commodore in New York City on December 4 and 5, 1956. The theme of the conference was "Progress Means Profits in the Vinyl Film Industry." Morning and afternoon technical sessions were held on both December 4 and 5 and an industry reception was held on December 4 beginning at 4:30 P. M.

David Carnegie, president of the Carnegie Coating Co., presided at the morning and afternoon sessions on December 4. It was at this session that Kendrick J. Gooch, assistant division engineer of the Farrel-Birmingham Co., Inc., presented his paper on "Design For Better Calendering." Mr. Gooch stated that in designing a calendar, the manufacturer is primarily concerned with: (1) Material or materials to be processed; (2) The finished width of these materials; (3) The range of film or sheet thicknesses; (4) The maximum rate of production required; (5) If the compound is a new one, what separating forces are expected; (6) The range of roll operating temperatures required, and (7) The power requirements which are involved.

Mr. Gooch went on to say that the ultimate aim in calender design is to create a machine which combines the following: (1) Maximum rigidity of roll positioning to maintain maximum accuracy; (2) Greatest flexibility in the range of materials and film and sheet thicknesses which can be produced; (3) An allowance for handling the materials of the future which, based on past experience, will require more power and greater roll stiffness, and (4) The accomplishment of the points noted at a cost considered reasonable by the customer.

### *Measuring Heat Stability*

"High Speed Milling Test for Measuring Heat Stability of Vinyl Calendering Compounds" by G. G. Himmler, development group leader of the Bakelite Co., was also presented at the morning session on December 4. Mr. Himmler stated that about three years ago it became evident that a test simulating high calendering speeds was necessary, and with the use of a newly acquired multispeed mill, such a test was developed by Bakelite. Mr. Himmler described the test and stated that it defines the heat stability of a compound in terms of (1) initial color, (2) color degradation rate, and (3) ultimate stability.

The test was found to be particularly adapted to development and control work, because the test requires only small amounts of raw materials. Since the over-all test period is generally under thirty minutes, it is possible to selectively determine the proper portion of each component influencing thermal stability.

Other papers presented at the morning session on December 4 included:

"Trends in the Vinyl Wall Covering Field" by Eleanor Pepper, chairman of the Department of Interior Design, Pratt Institute.

"Vinyl Applications in the Luggage Field" by E. H. Heitler, secretary and general manager of Shwayder Brothers, Inc.

Following a luncheon which was presided over by Kenneth L. Edgar, vice-president of the Firestone Plastics Co., the afternoon session got underway. Papers presented at this session included:

"How's the Climate" by Arthur "Red" Motley, president of Parade Publications, Inc.

"Public Relations in the Vinyl Film and Sheeting Industry" by George A. Bowie, Public Relations Department, Firestone Tire & Rubber Co.

### *Vinyl Industry Adhesives*

The morning and afternoon sessions on December 5 were presided over by Stanley Somerville, district sales manager in the Vinyl Film Department of the General Tire & Rubber Co. Richard Lilly, assistant industrial sales manager of the Angier Adhesives Division, Interchemical Corp., presented his paper on "Technology of Adhesives for the Vinyl Industry" at the morning session on December 5.

Mr. Lilly noted that with the increasing demand for rigid, semi-rigid, and flexible vinyls in combination with various substrates, the adhesive industry is faced with a multitude of chemical and physical requirements which must be tailored to the numerous laminations possible by the versatile properties of vinyl plastics. In general, he said, the adhesives adaptable for use in conjunction with vinyl laminations involve resinous and modified elastomerics, all of which are formulated with definite properties to meet specific conditions.

Mr. Lilly discussed methods of insuring maximum adhesion and longevity of the lamination to meet existing end product requirements. To this end, he outlined type of adhesive to be used, preparation of surfaces, and testing.

Other papers presented at the morning session on December 5 included:

"Rheology of Organosols and Plastisols" by Arnold Werner, development engineer of the Naugatuck Chemical Division, U. S. Rubber Co.

"The Vinyl Plastic Tape Story" by Dr. Hans Albu, research engineer of the Permacel Division, Johnson & Johnson Corp.

"New Vinyl Automotive Applications" by Raymond McCullough, design engineer of the Ford Motor Co.

"Agricultural Aspects of Vinyl Film and Sheeting" by John Murphy, technical service manager of the Monsanto Chemical Co.

Following luncheon, which was presided over by Eli Haddad, assistant director of technical service for the Monsanto Chemical Co., the following papers were presented:

"Marketing Techniques" by Bill Gove, vice-president of E. M. C. Recordings, Inc.

"The Value of Marketing Research to the Vinyl Film and Sheeting Business" by Gordon Brown, vice-president of the Bakelite Co.

### To Head Marco Development

John Marco has resigned as president of the Marco Co. of Philadelphia, Penna., to assume the presidency of the Marco Development Co., Wilmington, Del. Marco Development will be active in continuous production equipment design. Its principal line is continuous laboratory size reactors and mixers and commercial equipment. Mr. Marco is well known for the development of continuous processing, technological and mechanization methods.

Dr. Isaac Drogin, currently on a tour of the Far East, is shown above (right) as he addressed the Society of the Rubber Industry of Japan on December 6 on "New Thoughts on Carbon Black." An interpreter stands to Dr. Drogin's right.

### Van Valkenburgh Joins Schulman

H. F. Van Valkenburgh

A. Schulman, Inc., Akron, Ohio, has announced the appointment of H. F. Van Valkenburgh, formerly vice-president in charge of purchasing for Dunlop Tire & Rubber Corp., Buffalo, N. Y., as assistant to the president. His headquarters will be located at 33 Berkley Pl., Buffalo, N. Y. A civil engineer by profession, Mr. Van Valkenburgh is a graduate of New York University. Prior to entering the rubber industry, he was engaged in construction work for subways and locks and dams. In 1920, he joined Dunlop as assistant to factory manager. Later, he was placed in charge of purchasing, then was named secretary and finally vice-president of purchasing. During his 36 years with the Buffalo firm, he was procurement officer for 11 Dunlop companies in foreign countries.

Mr. Van Valkenburgh is a former president of the Purchasing Association of Buffalo and for 16 years, he served on both the Crude Rubber Committee and the Rules Arbitration Committee of the Rubber Manufacturers' Association. During the war, he was a member of the advisory board of the Office of Rubber Reserve, the advisory committee of the General Services Administration and the Rubber Committee of the Office of Price Administration. He is a member of the Rubber Division of the American Chemical Society, the Buffalo Rubber Group and the Visiting Advisory Committee of New York University. In 1955, the University presented Mr. Van Valkenburgh with a citation for "Distinguished Service and Professional Achievements."

### Gavitt Wire Expanding

Gavitt Wire and Cable Co., Brookfield, Mass., a division of the American Hard Rubber Co., has announced plans to construct a 35,000 square foot wire and cable manufacturing plant at Escondido, Calif. Construction on a 12-acre site began in January and the plant is scheduled for completion in June, 1957, at a cost of about three quarters of a million dollars. According to Gavitt officials, the new plant on the West Coast will permit the company to improve service and offer expanded lines to western customers.

### Orzon P Lignin Sulfonate

Crown Zellerbach Corp., San Francisco, Calif., has announced the introduction of "Orzan P", a new member of a group of surface-active lignin sulfonate chemicals. According to the company, Orzan P has the unusual property among lignin sulfonates of precipitating readily from solutions and clinging to fibers of other materials present. A spray-dried powder, Orzan P may be precipitated from even dilute solutions by the addition of alum. It is recommended as a binder for fibers, retention of fines, an emulsifier, an emulsion stabilizer, a flocculant and a dispersant. In addition to Orzan P, Crown Zellerbach markets: "Orzan A", esentially ammonium lignin sulfonate; "Orzan AL-50", which is Orzan A as a water solution containing 50% solids; "Orzan S", essentially spray-dried sodium lignin sulfonate; "Orzan SL-50", the 50% solids solution of Orzan S; "Orzan PL-40", a medium viscosity liquid, the 40% solids solution of Orzan P. Promising new uses have been demonstrated for this group of materials, among which are Orzan A used as an extender in polyvinyl adhesive.

### Introduces Chemigum Latex 247

The Chemical Division of the Goodyear Tire and Rubber Co., Akron, Ohio, has announced the introduction of a new butadiene-acrylonitrile latex, designated "Chemigum Latex 247", developed to give more resistance to discoloration resulting from exposure to heat or light. Improved light aging has been demonstrated by Fade-Ometer tests and by roof exposure, the company states. Pigmented compounds show even greater light-resistance than clear film. In test-exposures to heat, the company found that unpigmented films show only a slight discoloration after 16 hours at 250°F. According to Goodyear, the material shows excellent adhesion and fiber binding qualities and does not have the extreme sensitivity to copper and metal ions that is characteristic of natural rubber and many GR-S type latices. The latex is suitable for use in textile inks, non-woven fabrics, textile backcoatings and sizing, leather finishes, pigmented paper coating and carpet backings, the company states. Chemigum Latex 247 is available for drum or bulk shipping.

### Profile Rubber Formed

Profile Rubber Products Co. has been formed at Dover, N. H., as a subsidiary of the Davidson Rubber Co. of Boston, Mass. Operations are scheduled to begin shortly in a leased plant with 65 employees. Davidson Rubber officials stated that the new plant is an expansion move aimed at providing additional manufacturing space for an increasing number of products. Typical of these new products is a closed cellular sponge rubber gasket material marketed under the name of "Closel." Richard McMahan has been named manager of the new Dover plant.

### Harris Promoted by Huber

Gerald W. Harris

Gerald W. Harris, formerly assistant vice-president, has been named vice-president in charge of the Industrial Products Department of J. M. Huber Corp., New York, N. Y., succeeding the late R. H. Eagles. A native of St. Louis, Mo., Mr. Harris received a bachelor of science degree in chemical engineering from Iowa State College in 1943. Before he joined Huber, he was a chemist, compounder and processing foreman with the B. F. Goodrich Co. In 1947, Mr. Harris joined Huber's technical service laboratories in Borger, Texas, as chief chemist and later became a technical service representative in the southwest. He was appointed technical representative and assistant divisional manager for rubber sales at the company's industrial products headquarters in New York in 1949, was named divisional manager for rubber sales in 1953 and assistant vice-president in June, 1954.

### Bakelite Announces Appointments

Several new appointments have been announced by the Bakelite Co., New York, N. Y. Dr. A. W. Downes, former associate director of development, has been named general manager of new resins and compounds. A. A. Boehm, previously production superintendent of the Bound Brook, N. J., plant, has been appointed general manager of phenolics. Dr. C. M. Blair, Jr., who had been superintendent of Carbide and Carbon Chemicals Co., Seadrift Tex., has been appointed general manager of polyolefines. J. E. Brister, formerly manager of the Molding and Extrusion Department, has been promoted to general manager of polystyrene. R. D. Glenn, previously assistant works manager of Carbide and Carbon Chemicals, has been appointed general manager of vinyls. The new appointees will assist in coordinating and expediting all activities in the departments to which they have been assigned.

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### IRI Hears Polymer Corp. Lecture

On November 28, the London Section of the Institution of the Rubber Industry met in London to hear S. C. Kilbank deliver the 1956 Polymer Corp. lecture, "The Mixing Characteristics and Use of Improved Oil-Extended Rubber." After briefly outlining the development of oil-extended rubbers, Mr. Kilbank went on to describe the early difficulties associated with the large scale use of these polymers. The majority of these difficulties have now been overcome by an improved type of oil-extended rubber and the lecturer described in detail the measures taken to isolate the difficulties and thence to the development of this new polymer. In particular, he discussed the relative mixing characteristics of the former oil-extended rubber Polysar Krynol, the improved Krynol 651 and Polysar Krylene using a simple laboratory dispersability test which could be used to predict the mixing behavior of the polymers on a factory scale. Finally, Mr. Kilbank outlined some of the applications of this new polymer, laying particular stress on its use for tires. Both laboratory and road wear tests gave very favorable results.

### Appointed Marketing Coordinator

Walter J. Geldard, formerly plastics sales manager, has been appointed marketing coordinator for the Naugatuck Chemical Division, U. S. Rubber Co., New York, N. Y. Concurrently, the Plastics Department has been divided into three commodity groups headed by Edward Geise, Marvinol vinyl sales; Richard Malamphy, Vibrin polyester sales and Kenneth O'Keefe, Kralastic molding materials sales. Mr. Geldard joined the Fisk Rubber Corp., which later became part of U. S. Rubber, in 1925. He was transferred to Naugatuck Chemical in 1941 and was appointed chemicals sales manager the following year. He became plastics sales manager in 1953. In his new post, Mr. Geldard will advise all of the division's commodity groups on sales policies and merchandising methods.

### Industrial Plastics Seminar

Radio Receptor Co., Inc., Brooklyn, N. Y., has announced an educational seminar for executives and engineers of companies using or considering the use of plastics in their products, to be held beginning January 28 at the exhibition hall of the company at 251 W. 19th St., New York, N. Y. Radio Receptor is handling applications for attendance and acting as host company. A group of leading plastics producers, including Bakelite Co., General Tire & Rubber Co., Monsanto Chemical Co. and U. S. Rubber Co. will participate, and the Sheeting and Coated Fabrics Division of the Society of Plastics Industry has offered its full support. The seminar will include a series of lectures, exhibits and demonstrations, free of charge. Sessions will be held in the morning only.

**Like to make a suggestion to the industry? Write a letter to the editor! (See page 594).**

### Manual For Rubber Libraries

A preliminary version of its "Manual of Procedures for a Rubber Library" is now available on loan from the Rubber Division Library at the University of Akron, Akron, Ohio. The 199-page volume contains chapters on order work, cataloging and classification, reference, circulation and public relations. Also included are sample forms and a suggested list of reference books and periodicals. Current plans are to reduce the manual to a more concise form with an index. If demand warrants, the manual may be issued as a regular publication of the Rubber Division Library. With this objective in mind, it is suggested that those who borrow the manual submit criticisms and suggestions so that the final version will be more serviceable.

### Classification Index Available

The Research Association of British Rubber Manufacturers, Shawbury, Shrewsbury, Shropshire, England, has announced the availability of an alphabetical index to its "Systematic Classification of Scientific, Technological and Commercial Information on Rubber." The classification system, published as Information Bureau Circular No. 430 in February, 1956, was sponsored by the International Committee for Classification of Rubber Information. The alphabetical index, Information Bureau Circular No. 435, was designed to facilitate use of the classification system. Copies of the classification system and the alphabetical index are available from RABRM on request.

### Formulates Protective Coating

The Chemical Division of the Goodyear Tire and Rubber Co., Akron, Ohio, has announced the development of an organosol formulation, based on Pliovic AO vinyl dispersion resin, for use in decorative and protective coating applications on metal surfaces. Formulated with 35 parts of plasticizer per 100 parts of resin, this formulation provides flow characteristics specifically designed for metal applications and has excellent viscosity and dispersion stability. The coating may be applied by brush or spray. Versatility provided in the formulation of this material enables production of a harder coating with less tack and greater chemical resistance than is possible with comparable formulation with higher plasticization. The product is resistant to many acids, bases and metallic salts and provides protection against moisture and corrosive fumes, the company claims. An adhesive plastisol primer is recommended for use with the coating to assure maximum adhesion to metal surfaces.

### Hygienic Dental Mfg. Moves

Hygienic Dental Manufacturing Co. of Akron, Ohio, has moved to a new 17,000 square foot plant in Akron. The new plant and equipment is said to have cost $250,000. Founded twenty-six years ago by Walter P. Keith, now president, the company first produced dental vulcanite. Today, Hygienic produces plastic denture materials, latex dental dam and waxes and foot comfort mats.

## PURCHASE OF NEW MANUFACTURING FACILITY ANNOUNCED BY LINEAR

The purchase of a new 124,000 square foot manufacturing plant in Dallas, Penna., has been announced by Linear, Inc. of Philadelphia, Penna. Linear began the installation of new equipment and the move of some production facilities from the Philadelphia plant on December 1 and it is expected that the move will be completed by early 1957. Current plans are to occupy 86,000 square feet of the new plant and to reserve 25,000 square feet for expansion. The balance will be used for office space, maintenance facilities and other needs. The entire plant is zone air conditioned, permitting controlled temperatures and humidity in each of the production areas. Completely filtered air, a dust collection system, and electronic precipitators on the discharge stacks insure the highest possible freedom from airborne contamination in the milling and molding operations involved in the production of precision rings and seals. Purchase of the new plant was prompted by a lack of space in the company's Philadelphia facilities. When in full operation, the Dallas plant will employ between 450 to 500 persons. Shown above is an aerial view of the Dallas plant, indicating the size of the facility and the more than ample space for parking and future expansion plans of the company.

### Richardson Promotes Andrews

Frank M. Andrews

Frank M. Andrews, vice-president of the Sid Richardson Carbon Co., has been named vice-president and general manager of the Sid Richardson Carbon Co. and the Sid Richardson Gasoline Co., both of Fort Worth, Texas. Mr. Andrews joined the Richardson organization in 1948 as sales manager of the Sid Richardson Carbon Co. which had been organized to operate the Odessa, Texas, carbon black plant purchased from the government. Previously, Mr. Andrews had been associated with the Phillips Petroleum Co. for nineteen years. During this time he organized the Hycar Chemical Co. and started the Marketing Division for Philblack. In his new capacity, Mr. Andrews will continue to be located in the Fort Worth headquarters of the companies.

### Producing Insulated Wire

Reynolds Metal Co. has announced that a new addition to its wire and cable mill at Sheffield, Ala., for the production of neoprene and polyethylene covered and insulated electrical conductors is nearing completion. D. H. Hipp has been appointed manager and H. M. Barbour, cable mill superintendent of the unit. A new building, which brings total floor space of the overall cable operation to 174,000 square feet, houses the facilities. Equipment for applying thermosetting and thermoplastic coverings will be used initially for neoprene and polyethylene insulation. Equipment for fabricating self-supporting aerial secondary cables and complete equipment for quality testing have also been installed.

### Named Goshen Rubber President

Goshen Rubber Co., Inc., Goshen, Ind., has announced that William J. Johnson has succeeded the late Elmo E. Niccum as president and general manager of the company. Richard G. Bigler, secretary of the corporation, has been made assistant to the president and Wayne Burger has been appointed treasurer. In addition to the above, members of the board of directors include J. S. Royal, H. A. Anglemyer and Joseph L. Lantz.

### Lyckberg Joins W. R. Grace

Polymer Chemicals Division of W. R. Grace & Co., New York, N. Y., has announced that Berndt K. Lyckberg has been appointed general manager of the company's new high density polyethylene plant in Baton Rouge, La. Mr. Lyckberg has been closely associated with the manufacture of synthetic polymers related to oil refining operations and the plastics industry for the past 17 years. Born in Chicago, Ill., Mr. Lyckberg attended the Armour Institute of Technology, from which he received a degree in chemical engineering. He completed graduate courses at Armour and the University of Kansas City. During the war, he assisted Firestone Tire and Rubber Co. in the start-up and operations of three synthetic rubber plants at Akron, Ohio; Lake Charles, Louisiana and at Port Neches, Texas, where he became a technical manager. Since 1951, he has been manager of the chemical laboratories of Firestone Plastics Co., Pottstown, Penna. Mr. Lyckberg is a member of several professional honorary fraternities. He belongs to the American Institute of Chemical Engineers, the American Chemical Society, the Society of Plastics Engineers, the National Society of Professional Engineers and the American Society for Testing Materials.

### Borden Promotes Sullivan

Eugene J. Sullivan has been named vice-president in charge of sales for the Chemical Division of the Borden Co., according to an announcement by Augustine R. Marusi, president of the division. Formerly general manager of the Resins and Chemicals and the Polyco-Monomer Departments, he started with the division ten years ago as a salesman of packaging adhesives. In 1948, two years after joining Borden's as a salesman, he became assistant manager of the Packaging Adhesives Department, and in 1950 he was named sales manager of the Industrial Adhesives Department. Four years later he became general manager of the Resins and Chemicals Department and early this year took on the added responsibility for the Polyco-Monomer Department. A graduate of St. John's College, Mr. Sullivan came to Borden's after four years service with the U. S. Navy. He was a full lieutenant when discharged. Mr. Sullivan subsequently earned his master's degree in business administration at New York University.

### Hostettler Joins General Tire

James W. Hostettler has been appointed special representative for synthetic rubber sales by the General Tire and Rubber Co., Akron, Ohio. Mr. Hostettler is a native of Ohio and attended the College of Wooster, from which he graduated with a bachelor of science degree. After graduation, he served as a high school coach at Sebring, Ohio, for several years. Prior to his assignment with General Tire, he was associated with another rubber firm as a development engineer. Mr. Hostettler is a member of the American Chemical Society and the Akron Rubber Group.

### St. Joseph Lead Advances Due

Herbert J. Due

St. Joseph Lead Co., has announced that Herbert J. Due has been appointed assistant manager of zinc oxide sales with headquarters at the company's executive offices in New York City. Mr. Due joined St. Joseph Lead in 1926 and after 22 years in the Accounting Department served as zinc oxide sales representative in several eastern and southern states from 1948 to the present. Mr. Due's new duties will include sales-promotion of the company's zinc oxide on a national basis, supplementing the work of its regular distributors. In addition to his new duties, Mr. Due will continue his contacts with the firm's customers in the areas previously assigned to him. Mr. Due is an associate member of the Division of Rubber Chemistry, American Chemical Society, and has been active in the affairs of the New York Rubber Group of which he is currently chairman.

### Quality Control Short Course

The tenth annual short course in Quality Control by Statistical Methods will be offered by the College of Engineering, University of Illinois, with the cooperation of the Division of Engineering Extension at Urbana, Ill., from March 11 to March 21, 1957. Intensive work will be given in the fields of control charts and acceptance sampling and some time will be given to the rational setting of specifications and tolerances. The course is designed for those in the areas of design, production, procurement, management, quality control and inspection. For further information, write to: Professor John A. Henry, Mechanical Engineering Laboratory, University of Illinois, Urbana, Ill.

### Appointed Assistant to President

Rempel Manufacturing Inc., Akron, Ohio, has announced the appointment of Brice Bowman, former division commercial manager for the Ohio Bell Telephone Co., as assistant to the president. In his new post, Mr. Bowman will handle special assignments for the firm. He was elected to the board of directors at the annual meeting in September. Mr. Bowman retired from the telephone company in 1954 after 15 years as eastern division commercial manager.

## NATIONAL SCIENCE FOUNDATION SETS PROGRAM OF BASIC RESEARCH ON HIGH POLYMERS

The National Science Foundation, Washington, D. C., is currently supporting a new program of basic research on high polymers which was initiated on July 1, 1956. The program is providing support for the research of eleven investigators whose research on synthetic rubber was formerly supported by contracts with the Office of Synthetic Rubber, Federal Facilities Corporation and, during fiscal 1956, by contracts with NSF. Based on the recommendations of NSF's Special Commission for Rubber Research, the research program on synthetic rubber was terminated on July 30, 1956, and was replaced by a new program of support of basic research on high polymers. The investigators whose research on synthetic rubber was formerly supported by FFC and whose research is now supported by NSF under the new program are shown in the table below (numbers 7 through 17). In addition, NSF is supporting the basic research on high polymers being conducted by investigators whose research was not previously supported by FFC (numbers 1 through 7).

| *Institution* | *Investigator* | *Grant $ Yrs.* | *Date of Grant* | *Title* |
|---|---|---|---|---|
| (1) University of Illinois | L. F. Audrieth | 16,200-3 | 7/31/56 | Phosphorus—Nitrogen Compounds and Their Derivatives |
| (2) Cornell University | A. W. Laubengayer | 33,800-3 | 7/31/56 | Synthesis and Characterization of Inorganic Polymers |
| (3) Johns Hopkins University | J. W. Gryder | 21,300-3 | 8/2/56 | Chemistry of the Condensed Phosphates |
| (4) State University of New York | C. Schuerch | 11,800-2 | 7/31/56 | Stereoisomerism of Vinyl Polymers |
| (5) State University of New York | M. Szwarc | 30,800-2 | 7/31/56 | Polymerizations Initiated by Electron Transfer to Monomer |
| (6) University of Wisconsin | J. D. Ferry | 35,900-3 | 7/31/56 | Mechanical Properties and Polymer Structure |
| (7) Cornell University | P. J. Debye | 58,200-2 | 8/31/56 | Polymers in Strong Electrical Fields and Porous Media Flows |
| (8) Cornell University | P. J. Flory | 53,900-2 | 8/31/56 | Properties of Polymers and Their Solutions |
| (9) University of Illinois | C. S. Marvel | 62,800-2 | 8/29/56 | Synthesis and Relation Between Structure and Properties of High Polymers |
| (10) University of Illinois | F. T. Wall | 34,700-2 | 8/31/56 | Mechanics of Coiling Type Polymer Molecules |
| (11) University of Chicago | M. S. Kharasch | 59,900-2 | 8/31/56 | Chemistry of Polymerization and the Chemical Properties of Polymers |
| (12) University of Minnesota | I. M. Kolthoff | 59,000-2 | 8/31/56 | Kinetics and Mechanism of Emulsion Polymerization |
| (13) Massachusetts Institute of Technology | A. A. Morton | 57,600-2 | 8/31/56 | Polymerization and Polymers Produced by Organoalkali Metal Reagents |
| (14) Case Institute of Technology | S. H. Maron | 34,500-2 | 8/31/56 | Rheology of Suspensions of Spherical Particles and of Polymer Solutions |
| (15) University of Akron | M. Morton | 35,800-2 | 8/29/56 | Mechanism of Heterogeneous Addition Polymerization |
| (16) Mellon Institute | H. Markovitz | 43,500-2 | 8/31/56 | Physical Properties and Molecular Parameters of Polymers |
| (17) National Bureau of Standards | H. Leaderman and G. T. Furukawa | 37,700-1 | 8/29/56 | Rheology and Thermodynamics of Polymers |

### Design Engineering Show Planned

The Design Engineering Show will be held in the New York Coliseum from May 20 to 23, 1956, according to Clapp & Poliak, Inc., New York, N. Y., the exposition management. The show, held for the first time in Philadelphia last Spring, is the only exhibit devoted exclusively to the needs of design engineers. Concurrently with the show, the machine design division of the American Society of Mechanical Engineers will sponsor a conference on innovations in the design engineering field. The exposition, which will occupy three floors of the Coliseum, is already virtually sold out to exhibitors. Approximately 90,000-square feet of exhibit space will be used by about 375 of the nation's leading companies. Attendance is expected to reach the 20,000 mark. Types of products to be shown include mechanical, electrical, hydraulic and pneumatic components; metallic and non-metallic materials; fasteners; finishes and coatings; shapes and forms, and accessories to product development. Advance registration cards and hotel information may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y.

### Report On Ultrasonic Evaluation

Data on the principles, construction and operation of a device called the "STUB-meter" which enables non-destructive evaluation of structural adhesive bonds by ultrasonic technique and which is under development for the Air Force, have been summarized in a report just released through the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. The report, entitled *Development of Non-Destructive Tests for Structural Adhesive Bonds*, Part 4, by J. S. Arnold, Stanford Research Institute for Wright Air Development Center, describes progress of development of a portable, laboratory STUB-meter in sections of the volume covering system analysis, electronics, transducers, measurement and a projected exterior evaluation program. Published in June 1956, the 45 page volume, PB 121495, is priced at $1.25.

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Cosom Industries, Inc., has developed a holder, molded of Bakelite polyethylene, for drying women's hose. The unit, which can hold four pairs of stockings, is soft and smooth to touch, yet flexible and light in weight.

### Appointed Research Director

Thornton F. Holder has been appointed to succeed Dr. Albert W. Meyer as director of research for Diamond Alkali Co., Cleveland, Ohio. Mr. Holder will direct Diamond's exploratory research program, continue to be responsible for its patent and trade mark activities, supervise general purpose research facilities and other operations. He will also assist the president of the company in coordinating Diamond research efforts with the activities of its various operating divisions and organizational units. A graduate of Wesleyan University, Middletown, Conn., with the degrees of B.A. and M.A. in chemistry, Mr. Holder earned his LL.B. degree in 1938 from Fordham University, New York. He was associated with Moses and Nolte, patent attorneys of New York, from 1937 to 1943. From 1943 to 1946 he was an officer in the U. S. Navy on special assignment to the wartime atomic energy program. Mr. Holder joined Diamond Alkali in 1946 as patent counsel and eight years later was named research coordinator and patent counsel. He is a member of several national technical societies and associations.

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# Names in the News

**Willet J. McCortney,** formerly manager of the Organic Materials Laboratory of the Chrysler Corp., has been named director of automotive products development for the General Tire and Rubber Co., with headquarters in Detroit, Mich.

**Louis J. Fulop,** formerly product manager of Rivnut Sales, has been named manager of De-Icer and Rivnut Sales of B. F. Goodrich Aviation Products.

**Cyril P. Pesek,** vice-president of engineering, has been named vice-president of engineering and staff manufacturing, assisting Harold W. Rehfeld, director of the newly formed Staff Manufacturing Department of the Minnesota Mining and Manufacturing Co., St. Paul, Minn.

**Frank E. Firth,** technical and marketing engineer, has been appointed to head marketing research and product development in the recently established Elastomer Coatings Division of the Rhee Elastic Thread Corp., Warren, R. I.

**Glenn A. Zimmerman,** previously product manager of wheel and brakes in the Goodrich Tire and Equipment Co., has been named manager of new products sales for B. F. Goodrich Aviation Products.

**Thomas B. Crowell,** production manager for the Copolymer Rubber and Chemical Corp., Baton Rouge, La., has recently completed a course in Management Problems for Executives at the University of Pittsburgh.

**Russell P. O'Hara** has been promoted from manager of budgets to corporate controller of the Standard Products Co., Cleveland, Ohio.

**Harold M. Straub,** formerly manager of tire construction in the Los Angeles, Calif., plant of the B. F. Goodrich Co., has been named manager of tire construction and design.

**Morey Weisman,** previously with Ross & Roberts Sales Co., Inc. and Cohn-Hall-Marx Co., has been appointed sales manager of the newly created Plastics Specialties Division of the Middletown Rubber Corp., with headquarters in the New York City office.

**Dr. Sherman K. Reed** has been promoted from assistant director of the Research Department of the Niagara Chemical Division, Food Machinery & Chemical Corp., to assistant to the president, with responsibilities in research, for the new Organic Chemicals Division.

**Edward Lupsiewicz** has joined the Research and Development Department staff of the Barrett Division, Allied Chemical and Dye Corp., New York, N. Y., and will be engaged in technical service work on plasticizers.

**G. John Lambillotte,** formerly power area superintendent for Columbia-Southern Corp. at Barberton, Ohio, has been appointed project engineer for the firm.

**Gerald Hill,** previously sales manager of Goodrich International Rubber Co. in Manila, Philippine Islands, has been named manager of Industrial Products Sales for International B. F. Goodrich.

**Albert W. D'Armond,** formerly sales manager of Industrial Products Division of the General Tire and Rubber Co. and midwestern sales manager of the H. O. Canfield Co., has been appointed sales manager of the Wabash Rubber and Plastics Corp.

**Wayne K. Galloway** has been promoted from field sales engineer for B. F. Goodrich Aviation Products to manager of pressure suits and Avtrim Sales.

**Raymond G. Spain,** formerly associated with the General Motors Technical Center, has joined Wyandotte Chemicals, where he will be concerned with defense research projects in the Contract Research Department.

**John Peterson,** formerly associated with the Food Machinery & Chemical Corp., has been appointed sales manager of the midwestern region for the Polymer Chemical Division of W. R. Grace & Co.

**Harold M. Straub** has been promoted from manager of tire construction in the Los Angeles plant of the B. F. Goodrich Co. to manager of tire construction and design for the B. F. Goodrich Tire Co.

**Ralph M. Harper,** formerly supervisor of the Elastomers Branch, Aeronautical Materials Laboratory, Naval Air Material Center, Philadelphia, Penna., has transferred to the Naval Air Station in Pensacola, Fla. to become supervisor of the High Polymer Branch of the Materials Laboratory.

**Frank S. Treco, Jr.,** previously a sales engineer in Detroit, Mich. for Clevite Harris Products, Inc., has been appointed to the new post of sales manager.

**Jack Weiss,** vice-president of the Catalin Corp. of America, New York, N. Y., celebrated his twenty-fifth anniversary with the firm on December 18, 1956, and was presented with a gold watch.

**Mart B. Riggs,** chief engineer in automobile tire development at the Goodyear Tire and Rubber Co., has been awarded the P. W. and Florence B. Litchfield Award of Merit for his 1955 suggestion concerning a new type machine used in production for siping nylon Super Cushion tires.

**Harry F. McCarthy,** who has been associated with the Dunlop Tire and Rubber Corp., Buffalo, N. Y., for over 23 years, has been appointed sales manager of the Dunlop Pillo-Foam Division.

**George W. Dempsey,** manager of the St. Louis sales district for the Goodyear Tire & Rubber Co., was honored and presented with several gifts during recent ceremonies celebrating his 40th year with the firm.

**Edward E. Schwegler,** comptroller of the New Jersey Zinc Co., New York, N. Y. has been elected a vice-president of the company. He will continue to serve as comptroller.

**William J. Rothemich,** formerly divisional president of the Textile Colors Division of Interchemical Corp., New York, N. Y., has been elected a vice-president.

**C. O. Schwahn,** formerly a technical representative for the Surface Coating Division of the Bakelite Co., has been appointed a product specialist for latex materials.

**Charles W. Davies,** a member of the technical sales service, Tire Yarn Division at the Front Royal plant of the American Viscose Corp., has been transferred to the firm's New York office, where he will be concerned with the development of tire yarn in the industrial field with special emphasis on the mechanical rubber goods area.

**Irwin F. Smith, Jr.,** has joined the Molded Products Division, of the Stauffer Chemical Co. as an industrial engineer.

**Ben S. Cottle, Jr.,** has been appointed to represent Givaudan-Delawanna, Inc., and its associate companies, in the northern New Jersey area.

**Frank T. Downs,** formerly general sales manager for Houdaille-Hershey Corp., has been named sales manager for the Industrial Products Division of General Tire & Rubber Co.

**Edwin L. Trautman,** previously in charge of sales for the Thomas Phillips Co., has been appointed sales manager and John J. Haberbusch, who has been with the company for ten years, has been named office manager of Melflex Products Co., Inc., Akron, Ohio.

**Joe S. Gilliam,** associated with the B. F. Goodrich Co. since 1948, has been appointed manager of miscellaneous products sales for B. F. Goodrich Aviation Products.

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### for more current per circuit...more power per dollar

Anaconda specifies Enjay Butyl insulation for high-voltage cables because this rubber has incredible resistance to ozone. Surpassing the industry's standard three-hour specification test, Enjay Butyl insulation used by Anaconda showed *no injury after 72 hours* of ozone concentration tests—24 times longer than specification requirements. Other rubbers would deteriorate and crack in a fraction of this time.

With the help of Enjay Butyl, millions of feet of Anaconda's cable now in use deliver more current per circuit, more power per dollar.

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### Monarch Rubber Officers Named

Monarch Rubber Co., Hartville, Ohio, has announced that Ralph M. Fawcett has been named president of the company succeeding the late Robert J. Himmelright. Mr. Fawcett, who had been vice-president of the firm since its establishment in 1926, also served as president of the Republic Stamping and Enameling Co. from 1941 to 1952. After leaving Republic Stamping, which is now owned by Ekco Products Co. of Chicago, Mr. Fawcett started a consulting business under the name of Ralph Fawcett Co. Dale C. Hall, of Hall, Kistler & Co., certified public accounting firm, Canton, Ohio, has been made first vice-president of Monarch Rubber. He has been a member of the board of directors. Robert F. Simpson, vice-president and works manager, has been added to the board of directors. Robert J. Himmelright, Jr., who has been assistant to the president, has been elected a vice-president. He joined the company on a full time basis after serving in the Navy in World War II and in the Korean War. Homer K. Ashley will continue to serve as treasurer of the company. He has been with Monarch since its organization. In addition to Mr. Hall and Mr. Simpson, directors of the company include Mr. Fawcett, Mr. Himmelright, Millard Hamaker and Parker M. Seymour.

### Borden Opens PVC Resin Plant

The Chemical Division of the Borden Co. has activated its newly completed polyvinyl chloride resin plant at Leominster, Mass., and announced plans to build a new laboratory and office building. The Leominster facility is the first Borden polyvinyl chloride resin plant and is geared to produce 12,000,000 pounds a year. Company officials declared that Borden is entering the thermoplastics field on a broader scale than ever before and expects to triple the capacity of the Leominster plant before the end of the year. The new laboratory office building which Borden plans to complete this Spring will be a one-story steel and concrete building. To employ about 25 persons, the laboratory will have as its main objective the development and improvement of polymers and copolymers of vinyl chloride. Borden has also announced the acquisition of plant and office facilities at Leominster for production of a line of Resinate vinyl compounds for electrical wire and cable insulation.

### Appointed Research Director

Yale Rubber Manufacturing Co., Sandusky, Mich., has appointed William J. Snoddon, formerly senior research chemist at the Minnesota Mining and Manufacturing Co., St. Paul, Minn., director of research. In his previous position, Dr. Snoddon conducted and supervised extensive research on new resins, rubbers and rubber systems. He received his Ph.D. in chemical engineering at the University of Michigan and during World War II, served with the Air Force in the ETO. Dr. Snoddon is a registered professional engineer and a member of the American Chemical Society and the American Society for Testing Materials.

### Pennsalt Combines Two Divisions

Pennsylvania Salt Manufacturing Co., Philadelphia, Penna., has announced the consolidation of its Sharples operations with the Industrial Chemicals Division, in order to more effectively utilize personnel and facilities and contribute to accelerated future growth. The integrated operations of the new division include plants at Natrona, Penna., Wyandotte and Riverview, Mich., Calvert City and Marion, Ky., and Houston, Texas. Distribution of the products will be handled by a combined sales organization serving the eastern, southern and central areas through sixteen sales offices. The new unit, known as the Industrial Division, will be directed by general manager Hugh C. Land, formerly general manager of the Industrial Chemicals Division. Mr. Land is a native of Colorado and a graduate of the University of Denver, where he majored in chemical engineering. He joined Pennsalt in 1946 as a field engineer and later served as assistant superintendent of the company's Wyandotte plant and division production manager.

### Barrett Research Appointments

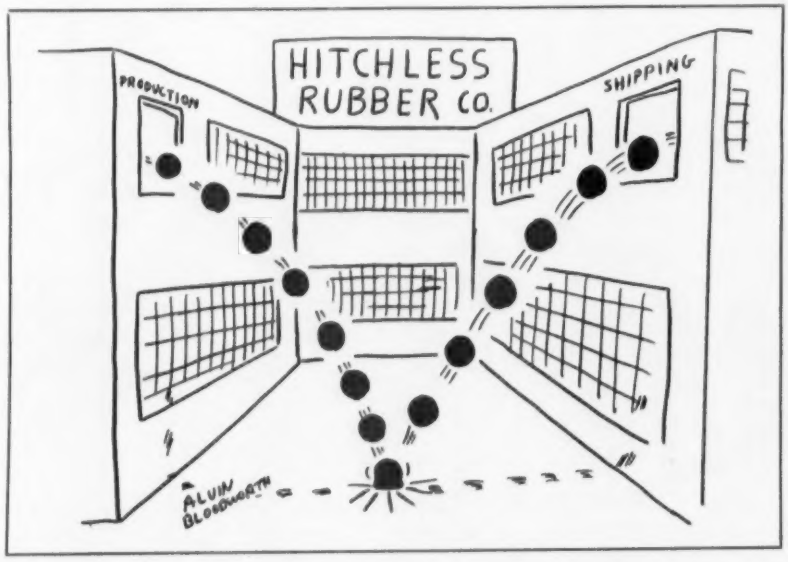
Barrett Division of the Allied Chemical and Dye Corp., New York, N. Y., has announced five appointments to the Research and Development Department. Dr. Maurice H. Bigelow, formerly director of research, has been appointed technical director. Dr. Werner E. Kleinicke, previously director of the Shadyside Applications Research Laboratory, Edgewater, N. J., has been named director of research at the Glenolden, Penna. Laboratory. Wolcott L. Steele, who had been chief project engineer, has been named director of development for Barrett. Bruce T. McMillan, has been promoted from supervisor to the plastic application group at Shadyside to director of the Shadyside Applications Research Laboratory. James B. Maguire, who has been with Barrett for 23 years, has been appointed to the staff of Barrett's Research and Development Department as chemical engineering advisor to the technical director.

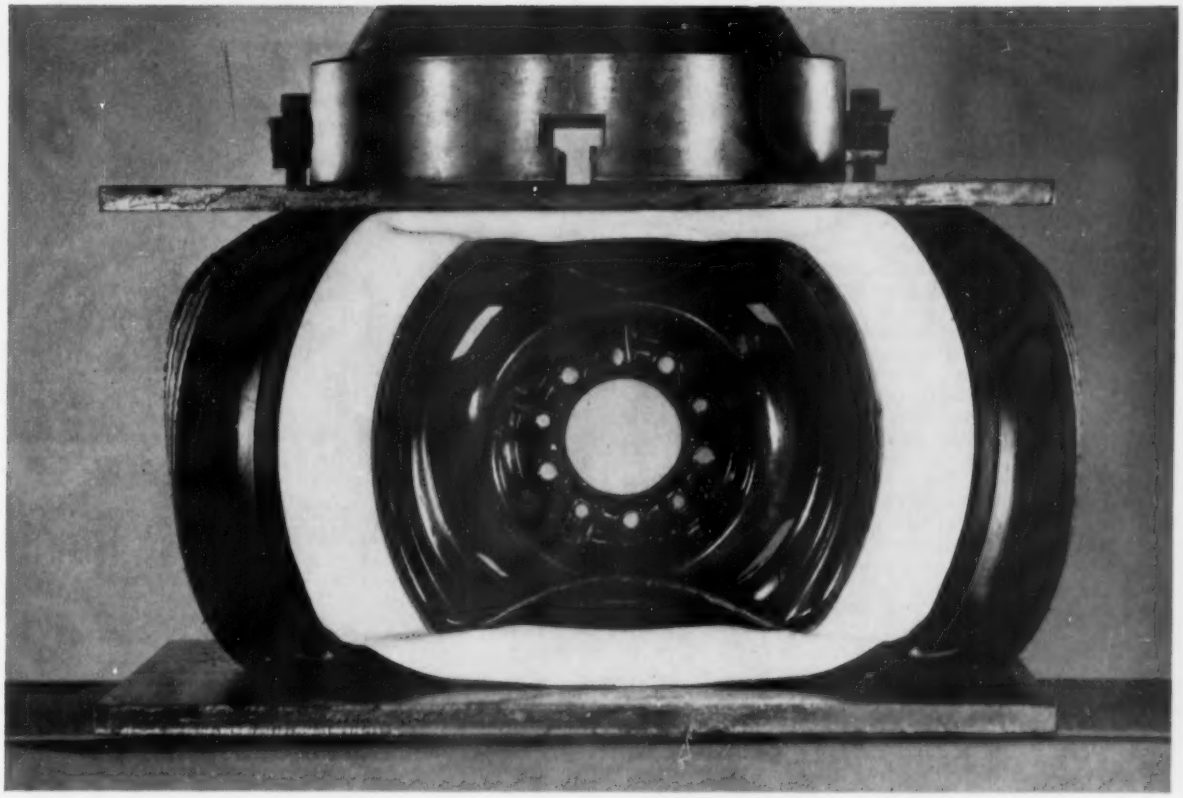
### New Polymer Division Officers

The Division of Polymer Chemistry of the American Chemical Society has elected Dr. Thomas G. Fox, head of the polymers research laboratory of Rohm and Haas Co., Philadelphia, Penna., as chairman for 1957 succeeding Dr. Raymond F. Boyer of the Dow Chemical Co., Midland, Mich. Professor A. V. Tobolsky, of the Frick Chemical Laboratory, Princeton University, was chosen vice-chairman and Dr. F. H. Winslow, of the Bell Telephone Laboratories, Murray Hill, N. J., was named secretary-treasurer. Dr. Fox, a native of Union Deposit, Penna., received a B. S. degree at Lebanon Valley College in 1940 and a Ph.D. at Columbia University in 1943. He taught chemistry at Columbia for a year before serving in the U. S. Navy from 1944 to 1946. Afterwards, he joined the Goodyear Tire and Rubber Co. until 1948, at which time he became a research associate at Cornell University. He joined Rohm and Haas in 1950. Dr. Fox is the author of several papers on polymers and is chairman of the high polymer physics division of the American Physical Society.

### Licenses Plastisols Patent

Non-exclusive, non-assignable licenses allowing plastics processors to make plastisol-fabricated vinyl plastics using Monomer MG-1 are now being offered by the Union Carbide and Carbon Corp. acting through its Division, Carbide and Carbon Chemicals Co. The license agreement, based on U. S. Patent 2,618,621, allows plastics manufacturers to make, use, and sell vinyl plastisols, containing Monomer MG-1, one of Carbide and Carbon's newest commercially available chemicals. The company intends to make available to licensees the results of an extensive research program on vinyl plastisols. Plastisols based on MG-1 produce resins with a hardness range never possible when conventional plasticizers alone are used as dispersants, Union Carbide states.





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# Financial News

## NET INCOME OF $60,538,848 SETS NEW FIRESTONE RECORD

In its report for the fiscal year ended October 31, 1956, Firestone Tire & Rubber Co., Akron, Ohio, announced that the net earnings of the company and its subsidiaries reached a record high in spite of reduced volume of sales in the automobile industry and a decrease in defense production. Net sales were $1,115,179,783 compared with $1,114,870,187 in the 1955 fiscal year. Net income amounted to $60,538,848, which is equal to $7.43 per share of common stock, compared with $55,378,916, or $6.81 per share of common stock. Profits of foreign subsidiaries totaled $13,080,665.

A total of $4,350,000 of long-term debt and $1,200,000 of preferred stock were redeemed. Net working capital at the close of the year was $321,281,115 compared with $308,185,327. Dividends of $2.60 per share were paid on the common stock of the company. Aggregate dividends on the common and preferred stock amounted to $21,294,388.

According to the company, major additions were made to its plants in the United States and abroad. A new plant for the manufacture of coated fabrics was established at Magnolia, Ark., and new tire factories are under construction in Cuba and the Philippines. Extensive mechanical changes in all of Firestone's domestic factories were necessitated by the adoption of fourteen-inch wheels by most of the passenger car manufacturers for 1957 models. Additions to and improvements in plants and equipment amounted to $58,570,529 in 1956, compared with $55,723,138 in 1955. Provisions for depreciation amounted to $36,933,867 compared with $32,020,916 in the previous year.

Firestone's expansion program included increased capacity and improvements in processing equipment for the production of tires, natural and synthetic rubber. Capacities at the synthetic rubber plants at Lake Charles, La., and Akron, Ohio, have been substantially increased. When these plants were purchased from the government in 1955, they had a combined capacity of 129,600 long tons. Completion of the present expansion program early this year, will increase capacity to 230,000 long tons. A new plant for the manufacture of butadiene, under construction to supply these plants, is the first unit of a new Firestone petrochemical center on a 1,000-acre site at Orange, Texas.

The company also has a financial interest in a synthetic rubber plant now under construction in England. There is an increasing demand for rubber abroad and the company has again increased production of natural rubber on research plantations in Guatemala. More than 1,200 acres of rubber trees were planted on a new Firestone plantation in Brazil and surveys are in progress to find a suitable site for projected rubber plantations in the Philippines.

### Armstrong Rubber Co.

Year ended September 30: Net income of $2,797,963, which is equal to $1.80 per common share, compared with $2,734,133, or $1.74 a share, in the previous year. Net sales in 1956 were $71,313,421 compared with $68,981,866 in fiscal 1955. The results of the company's 50 per cent owned affiliate Armstrong Tire and Rubber Co., Natchez, Miss., and Copolymer Rubber and Chemical Corp., in which Armstrong Rubber has a 28.6 per cent interest, are not consolidated with those of the company. The net income of these affiliates amounted to $4,008,362 for the 1956 fiscal year. After deducting dividends of $258,000 received during the year, Armstrong Rubber's equity in these earnings total $1,089,756. The company reports that this is the largest dollar volume of sales in its history.

### Dayton Rubber Co.

Year to October 31: Net income of $2,600,000, which is equal to $3.60 a share, compared with $2,321,477, or $3.44 a share in the previous fiscal year. Net sales in 1956 totaled $76,000,000, compared with $69,150,073, in fiscal 1955. These figures exclude the company's share in undistributed profits of domestic companies in which it has less than a majority interest, amounting to about $340,000 in the latest year and $190,000 a year earlier. According to the company, sales and earnings in fiscal 1956 were the highest in its history. Dayton Rubber plans a new financing of between $4,000,000 and $5,000,000 of subordinated convertible debentures to be issued in the near future to provide funds to finance an increasing volume of business.

### Thermoid Company

Nine months to September 30: Net income of $1,318,599, which is equal to $1.50 per common share, compared with $1,085,938, or $1.20 a share, in the nine month period of the previous year.

### Brunswick-Balke-Collender Co.

Nine months to September 30: Net income of $2,242,931, which is equal to $4.32 a common share, compared with $907,185, or $1.73 a common share, in the nine month period of the previous year.

### Anaconda Wire & Cable Co.

Nine months to September 30: Net income of $7,220,330, which is equal to $8.55 per share, compared with $4,651,569, or $5.51 a share in the same period of 1955.

### Electric Auto-Lite Co.

Nine months to September 30: Net income of $1,195,476, which is equal to 75c a share, compared with $6,797,122, or $4.25, in the 1955 nine month period.

### Appointed Marketing Director

George R. Lawson

Pennsylvania Salt Manufacturing Co., Philadelphia, Penna., has announced the appointment of George R. Lawson as director of marketing for the company's newly created Industrial Division. Mr. Lawson will direct the combined sales organizations of the former Sharples and Industrial Chemicals Divisions. The consolidation of these units is reported elsewhere in this issue. Mr. Lawson joined the Pennsalt organization in 1946 and served successively in the former Sharples Division as manager of its New York Office, general manager of sales and vice-president in charge of sales. He is an alumnus of Yale University, where he majored in chemistry.

### Stupp Announces Retirement

Barrett Division, Allied Chemical & Dye Corp., New York, N. Y., has announced the retirement, effective December 31, 1956, of C. G. Stupp, vice-president. Mr. Stupp, who is a graduate of Cornell University, has been associated with Barrett for 40 years, starting as a research chemist in the Edgewater plant. Since that time, he has held various positions in sales, manufacturing and research. Prior to his appointment as vice-president in 1954, Mr. Stupp had been technical director of Barrett for four years. As vice-president, he continued to direct the technical activities of the division, including the Research and Development Department. Mr. Stupp is a member of the American Chemical Society and the American Institute of Chemical Engineers. The retiring vice-president's responsibilities for the direction of Barrett's technical program will be assumed by Dr. Maurice H. Bigelow, newly appointed technical director.

### Sherman Rubber Machinery Formed

Sherman Rubber Machinery Co. has been formed as a division of Botwinik Brothers of Mass., Inc., Worcester, Mass. The new division began operations on January 1, 1957, under the direction of John R. Busser. Sherman Rubber Machinery will offer new, used and rebuilt rubber processing machinery. In addition, it will manufacture special machinery to specification.

# Cure-alls won't improve your digestion...

## ...but Velsicol custom made reclaiming oils will!

Rubber reclaimed by the alkali, pan-process or neutral digester process swells more readily, has lower tailings, has desirable plasticity, and is easier to incorporate into synthetic or natural rubber when you use Velsicol reclaiming oils custom-made for your operating conditions. Let a Velsicol representative study your needs, and make recommendations. No cost or obligation.

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# West Coast News

A. Schulman, Inc., has established a West Coast office in Los Angeles. The new quarters, at 1127 Wilshire Blvd., will be under the supervision of Frank M. Francis, vice-president in charge of the West Coast division. Mr. Francis is a 22-year veteran with the Schulman organization in both the rubber and plastic industries. He has specialized in plastics and headed up the plastic division. His wide service in the rubber field includes previous assignments in East St. Louis, Ill., Los Angeles, Boston, and Akron. During World War II he was a member of the War Production Board.

Harold B. Gartner has been named vice-president in charge of production for American Latex Products Corp. of Hawthorne, Calif. In his new position, Mr. Gartner will be in charge of the manufacture and fabrication of the company's foam rubber, plastics, and adhesive divisions, and of the maintenance and engineering departments. During the past four years Mr. Gartner occupied the position of plant superintendent. He was one of the plant's original employees, progressing to his present position from foam rubber fabricator in 1939. Mr. Gartner also will be in charge of the American Latex Products' $10,000,000 plant expansion program currently in effect.

Griffith Rubber Mills, Portland, Ore., has arranged for the purchase of the Chemical-Proof Corp. of Seattle, Wash., which will continue operation as a subsidiary of the Portland firm. Chemical-Proof is engaged in the application of various types of protective coatings. George C. Houghton, formerly vice-president in charge of sales for Chemical-Proof has been appointed resident manager. Norman J. Johnson, executive vice-president and general manager of Griffith Rubber, will serve in a similar capacity at Chemical-Proof. Griffith Rubber has also announced that the installation of $50,000 worth of new equipment is now under way in a building adjacent to the company's present facility in Portland.

A radioactive gage that is said to assure more durable and uniform rubber for tires and other products is now being used by the Goodyear Tire and Rubber Co., in its Los Angeles plant. The device is called a "Betameter" because it uses beta rays to gage fabric as it is being coated with rubber on the plant's calenders. The rays pass upwards through the rubberized fabric and are converted by a detector into electrical signals that show the weight and thickness of the fabric. The signals also control these factors by activating adjustments in the calenders. Source of the beta rays is strontium 90, a radioactive material that is not injurious to rubber. Gaging of the rubberized fabric is continuous, permitting automatic control of the calenders. Hand or direct gaging, often a cause for incorrect readings, is eliminated.

The Betameter allows less than 1% variation from desired standard in the production of rubber sheeting. It controls per square yard weight of sheeting in a wide weight range with an accuracy better than one-eightieth of a pound. According to Richard V. Thomas, manager of Goodyear's Los Angeles plant, the Betameter has resulted in the production of more durable and uniform tires at no extra cost for material or labor.

The installation at Goodyear's Los Angeles plant represents an initial use of the Betameter which is made by Isotope Products, Buffalo, N. Y. Additional units are being built for other Goodyear tire-producing plants.

### Offers Coating Concentrates

Modified latex emulsions, combining cement and "cementitious" materials for use as coatings for interior and exterior structural surfaces, have been developed by the Research Institute of Georgia Institute of Technology and are available in one, five and 55-gallon metal containers from Surco International Corp., Atlanta, Ga. The concentrates are based on Pliolite latex. Addition of the latex to the cement concentrates provides flexibility, impact strength, water resistance and improved adhesion to other surfaces. The exterior concentrate is resistant to water, weather, inorganic acids, alkalies and salts and will adhere to concrete, masonry, stone, wood, metals, glass or practically any other clean surface. The latex binder developed for interior applications possesses high tensile strength and resistance to organic fats and oils and exhibits hard wearing characteristics.

### Constructs Acrylate Ester Plant

Celanese Corp. of America, New York, N.Y. has started construction of a new acrylate ester plant in Pampa, Tex. Production is expected to begin during the last quarter of 1957 and a capacity of 15,000,000 pounds of acrylic acid esters per year is planned. These new facilities represent the latest step in the Celanese chemical expansion program which also includes the recent completion of a new plasticizer and functional fluid plant in Point Pleasant, West Va., and construction of a new polyol production unit in Bishop, Texas. Alcohols and other material currently in large volume production by Celanese will provide raw material for the Pampa acrylate plant. The plant output will include a wide range of acrylic acid esters including methyl, ethyl and butyl acrylates.

**What's going on abroad? Read "Overseas" by Reuter's. (See page 714).**

### Releases Elastomeric Studies

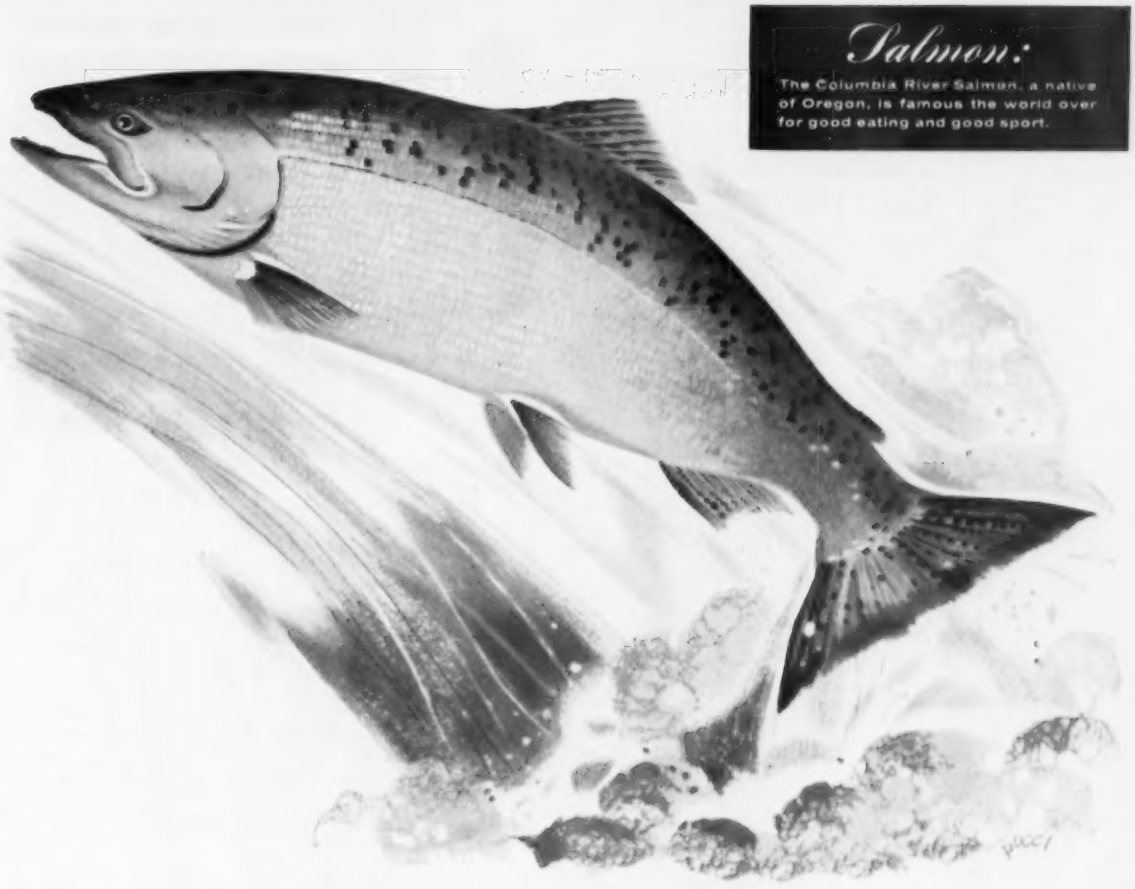
Three Air Force research reports now available through the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., investigate the suitability of materials for use as elastomers. The first of the reports, PB 121498, is entitled *Research on the Synthesis of Polar Silane Monomers,* by R. M. Silverstein, L. Goodman and A. Benitz, Stanford Research Institute for Wright Air Development Center. The 30 page report summarizes work on a two objective project: synthesis of polymerizable polar silane monomers for use as modifiers for improved silicone rubbers and the copolymerization of certain of the monomers with dimethylsilicone. This report was published in May, 1956 and is priced at 75 cents. The second report, PB 121529, relates the results of experiments in which six epoxide monomers were prepared for use as thermally stable elastomers. Preparation and properties of the structure of fluorinated epoxides substituted in the 1- and 1,2-positions are described. Entitled *The Preparation and Properties of Some New Fluorine-Containing 1,2- Epoxides,* by D. A. Rausch and A. M. Lovelace, Wright Air Development Center, the 11 page report, which was published in May, 1956, sells for 50 cents. The final report, *Elastomeric Polyphosphates* by R. A. Hubbard, II, and U. S. Strauss, Rutgers University for Wright Air Development Center, discusses preparation of an elastomer based on the polyphosphate chain with required thermal, moisture and lubricant stability. The 49 page volume, PB 121516, was published in August, 1955 and is priced at $1.25.

### ASTM Standards Supplements

American Society for Testing Materials has announced the availability of its 1956 Supplements to the 1955 Book of ASTM Standards. The supplements come in seven parts at $4.00 a part. Each of the parts concerns itself with a specific subject or field and Part 6 covers Rubber, Plastics, and Electrical Insulating Materials. Comprising 380 pages, Part 6 includes 71 standards covering plastics; electrical insulating materials; rubber products (processability tests, interlaboratory tests, synthetic elastomers, physical tests for vulcanized rubber, low temperature tests of rubber, automotive and aeronautical rubber, packing and gasket materials, hose, electrical protective equipment, insulating wire and cable, latex foam sponge and expanded cellular rubber, non-rigid plastics); and electronics materials.

### Barrett Doubles Phenol Capacity

Barrett Division, Allied Chemical and Dye Corp., New York, N. Y., has announced that expansion of synthetic phenol capacity at its Philadelphia, Penna. plant should be completed early in 1957. Completion of expansion will increase production to twice the capacity of the original installation, which was placed in operation about three years ago. The plant then will be the largest as well as the most modern phenol installation on the eastern seaboard, the company says.

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# Canadian News

The Canadian rubber footwear industry has submitted a 33-page brief to the Canadian Tariff Board in which it states that higher duties are necessary against the threat of growing imports of rubber footwear and rubber soled canvas shoes from low wage countries. The brief added that Canadian exports of canvas and waterproof rubber footwear, previously about one-third of the Canadian output, have been virtually wiped out by overseas competition.

On the Canadian market, imports of rubber-soled canvas shoes from low wage Asiatic countries have grown to about 50 per cent in the last five years and imports of rubber footwear have doubled to 11.2 per cent in the last two years. Indications are, the brief states, that the rate of growth of rubber footwear imports will continue at an accelerated pace, paralleling the rapid increase of canvas shoe imports.

The $25,000,000 Canadian rubber footwear industry, which is centered in Ontario and Quebec, asked the government to restore a 15 per cent duty, eliminated in 1932, under the British preferential tariff on rubber footwear. Wages in the Canadian industry at the end of 1954 ranged between $1.06 and $1.54 an hour. In Hong Kong wages ranged between four and 15 cents an hour and in the United Kingdom, wages were less than half of Canadian wages, the report said.

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The 11th Divisional Conference of the Protective Coatings Division of the Chemical Institute of Canada will be held in Toronto at the Seaway Hotel on February 21, and in Montreal at the Ritz Carlton Hotel on February 22. The same program is scheduled for both cities. This continues the successful two-city meetings that this Division inaugurated in 1953. The speakers will include: W. M. Kraft (Heyden Chemical), "Considerations in the Processing and Uses of Pentaerythritol Alkyds"; J. K. Hossack, (Ferro Enamels-Canada), "New Developments in Inorganic Coatings"; W. N. B. Armstrong, (Ontario Research) and J .W. Suggitt (Hydro-Electric Power Commission of Ontario), "Coatings Evaluation and Laboratory Correlation with Field Experience"; R. R. Hunter (A. V. Roe), "Coatings for High Speed Aircraft"; and W. B. Anderson (Titanium Pigment), "The Properties and Uses of Some Organic Compounds of Titanium".

A. J. Lily (Canadair), is to be the luncheon speaker at both sessions. His subject is "Supersonic High Speed Test Flying", in which he will describe the experience of a test pilot flying high speed aircraft.

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Preparations are under way for the 1957 Annual Conference of the Chemical Institute of Canada, which will be held at the University of British Columbia, Vancouver from June 3 to 5, 1957. Arrangements are being made for a technical program, a variety of social functions, entertainment, plant visits and a ladies' program. Some of the activities planned are a golf tournament, an outdoor salmon barbecue and an evening boat excursion including cocktails and dinner. A large attendance is anticipated. Accommodations for visitors to the conference will be available both on the University campus and in downtown Vancouver hotels.

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Dow Chemical Co. of Canada, Sarnia, Ontario, has announced plans to double its ethylene production and begin production of ethanolamines early this year. Two units, built at a cost of more than $2,000,000 are now in final stages of construction. According to the company, the second ethylene plant will increase production capacity by 100 per cent and make the Sarnia plant the largest ethylene producer in Canada. Part of the added ethylene output will be used to produce ethanolamines which are now imported from the United States. Dow will be the first company in Canada to produce ethanolamines.

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A $500,000 plant to manufacture polyethylene film is to be constructed at Fort Garry, Manitoba, by Visking, Ltd., to service the western Canadian market. The plant, with about 15,000 square feet of space, will be located on a 12-acre site and will employ about 40 persons at the start-up of operations. The firm's main Canadian plant is at Lindsay, Ont., and it also has a plant at Ajax, Ontario. It was also announced that company directors will soon meet in Chicago, Ill., to consider an offer of merger made by the Union Carbide and Carbon Co. of New York, N. Y.

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Standard Wire and Cable, Ltd., has announced entry into the wire and cable field as a major producer. Their new plant, located at 70 Wingold Avenue, Toronto, Canada, is said to incorporate every new development in automation and engineering and to be the most modern of its kind in North America.

### Alphaduct Building Wire Plant

Alphaduct Wire & Cable Co., Milltown, N. J., wholly-owned division of the General Cable Corp., New York, N. Y., has begun construction of a plant at Bonham, Texas, 85 miles northeast of Dallas, to manufacture wire and cables for independent telephone and electrical companies. According to current reports, total investment in the plant will be about $5 million, including stocks and inventory. Operation of the plant is expected to start in the spring of 1957 with initial employment of 200 persons. This will be the fourteenth General Cable plant in the United States.

### Schrank Celebrates Anniversary

Harry P. Schrank

Harry P. Schrank, executive vice-president of Seiberling Rubber Co., Akron, Ohio, observed his 30th year of association with the company on November 15, 1956. Mr. Schrank joined the company as a tire designer. He was named factory superintendent in 1934 and two years later became vice-president in charge of production. In 1937, Mr. Schrank was elected to the company board of directors and in May of 1956, he was appointed executive vice-president. Mr. Schrank is vice-president of the board of directors of the University of Akron, which he attended, and vice-president and director of the Copolymer Rubber and Chemical Corp., Baton Rouge, La.

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### Marsh Promoted by Carbide

J. Lee Marsh has been appointed vice-president of development for the Carbide and Carbon Chemicals Co., New York, N. Y. Dr. Marsh will be responsible for the Development Department and for all phases of textile fibers activities. Dr. Marsh joined Union Carbide in 1933 in the Engineering Department of Carbide and Carbon Chemicals Co. at South Charleston, West Va. He moved to New York in 1946 to fill a staff position under one of the company's vice-presidents. In 1952, he returned to Charleston to become director of engineering for the company, a position he held until his present appointment. Dr. Marsh attended Yale University, receiving a bachelor of science degree, cum laude, in 1930 and a Ph.D. in 1933.

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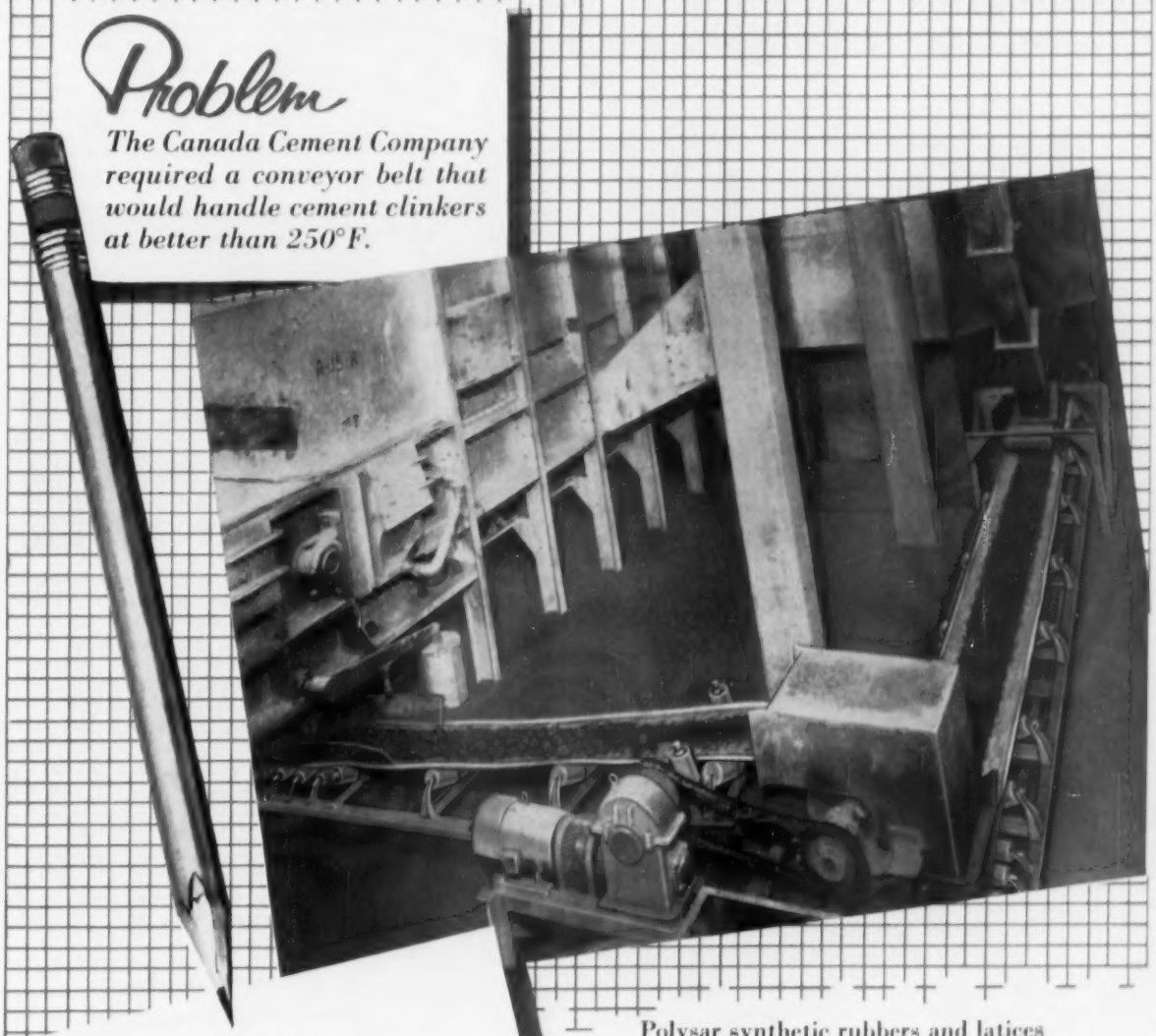
### To Head ACS Akron Section

Ralph F. Wolf, manager of compounding research at the research laboratory of the Columbia-Southern Chemical Corp. at Barberton, Ohio, has been appointed to fill the unexpired term of Dr. N. V. Seeger as chairman of the Akron Section of the American Chemical Society. Mr. Wolf became chairman-elect of the organization last summer. Dr. Seeger, formerly associated with Goodyear, recently left Akron to take a position with the Diamond Alkali Co. at Painesville, Ohio. Dr. Will S. Thompson of Kent State University has succeeded Mr. Wolf as chairman-elect of the section.

## Problem

*The Canada Cement Company required a conveyor belt that would handle cement clinkers at better than 250°F.*



## Solution

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# Obituaries

### *Sidney A. Brazier*

Sidney Albert Brazier, retired general manager of the General Rubber Goods Division of the Dunlop Rubber Co. died on November 25 at his home in Gloucestershire, England. He was 66 years old. Born in Birmingham, Mr. Brazier attended Birmingham College, where he received the B.Sc. and M.Sc. Later he became a lecturer in the Chemistry Department of the Municipal College of Technology at Birmingham. During World War I, he served with the R.N.A.S. and the R.N.V.R., and later joined Dunlop's technical staff as deputy to the chief chemist.

Mr. Brazier had been associated with Dunlop for 37 years at the time of his retirement, working in various technical capacities. Actively engaged in organizations connected with the rubber industry, Mr. Brazier was associated with the British Standards Institution as chairman of both the Industry Standards Committee and the (ISO/TC45). At the time of his death, he was chairman of the technical committee of the Federation of British Rubber Association and Allied Manufacturers' Association.

During World War II, he became chairman of the industry committee advising Rubber Control on problems connected with the shortage of natural rubber and the conversion of industrial goods to synthetic rubber. In 1945, 1946 and 1947, he organized and led a number of teams to Germany to investigate rubber manufacture there. For his war services, he received the O.B.E. in 1948. He was elected a Fellow of the Institution of the Rubber Industry in 1926, was awarded the Colwyn Medal in 1944 and delivered the IRI Foundation lecture in 1953 on "The Economics of Technical Development." For many years he served as a member of the Examinations and Qualifications Board of the Institution of the Rubber Industry.

### *Paul L. Fisher*

Paul Luther Fisher, superintendent of the reclaim plant at the Goodyear Tire and Rubber Co., Akron, Ohio, died on December 3 in Green Cross General Hospital, Cuyahoga Falls, Ohio. Born in Thornville, Ohio, Mr. Fisher taught school for a year before he joined Goodyear in 1914. At the time, he was assigned to the production training squadron and two years later was named shift foreman. He became general foreman of the reclaim plant in 1939 and superintendent in 1944. Last July, Mr. Fisher was presented with the Paul W. and Florence B. Litchfield Special Award of Merit for his achievement in the development of a new and shorter process in rubber reclaiming. He was the twenty-eighth Goodyear employee to receive such an award. Mr. Fisher was a member of Goodyear's Foreman's Club and 25-Year Club and was a 32nd degree Mason.

### *Farnham Yardley*

Farnham Yardley, chairman of the board of directors of Jenkins Brothers, New York, N. Y., died on December 30 in the Memorial Hospital, Orange, N. J., after a short illness. He was 88 years old. Before becoming board chairman in 1947, Mr. Yardley had served as vice-president of the Jenkins concern from 1911 to 1917, and then as president. He was also chairman of the board of Jenkins Brothers, Ltd., of Montreal; chairman of the board of the First National Bank of West Orange and past-president and member of the Advisory Committee of the American Supply and Machinery Manufacturers Association. A graduate of Phillips Academy, Andover, Mass., Mr. Yardley was a member of many civic and social organizations and has held several political posts in his community. He is survived by his wife and a son.

### *Urban H. Parker*

Urban H. Parker, associated with the rubber industry since 1919, died on December 12 at his home in Keokuk, Iowa. He was 61 years old. A native of Morrisville, Vt., Mr. Parker joined the Miller Rubber Co. in Akron, Ohio, in 1919. In 1928 he left Miller to accept a position at the Featheredge Rubber Co., Chicago, Ill., and helped found the Chicago Rubber Group. He returned to Akron in 1932 to become production manager of the Sponge Rubber Division of the B. F. Goodrich Co., and in 1937 he joined the Dryden Rubber Co., working in the Keokuk, Iowa plant until the time of his death. Mr. Parker was active in the Keokuk Chamber of Commerce and the Masonic bodies of Iowa. Surviving are his wife and a daughter.

### *Edith F. Kahn*

Mrs. Edith F. Kahn, former president of Maxwell Rubber Products Corp., Clifton, N. J., died on November 13th in French Hospital in New York City after a brief illness. She was 58 years old. Mrs. Kahn was born in New York City and lived in Akron, Ohio and Cumberland, Md. before she returned to the New York area. She became president of Maxwell Rubber in 1935 after the death of her husband, who founded the company, and was active in its management until her retirement in September, 1956. Mrs. Kahn is survived by two sons, one of whom, Michael M. Kahn, is still associated with Maxwell Rubber Products.

### *William A. Ross*

William A. Ross, sales representative of the St. Joseph Lead Co., New York, N. Y., died on December 18 at the Norwalk Hospital, Norwalk, Conn. He was 41 years old. Mr. Ross had been an assistant to the vice-president in charge of sales of St. Joseph Lead since 1954.

### *Harmon Connell*

Harmon Connell, compounding manager of the Armstrong Tire and Rubber Co., Natchez, Miss., died on December 31, as the result of an accident. He was 40 years old. Born in Eufaula, Ala., Mr. Connell attended Mississippi State College, from which he was graduated in 1939 with a degree in chemistry. In December 1939, he

joined the Armstrong Tire and Rubber Co. as a production employee and in 1940, he was transferred to the laboratory. During World War II, he served in the Chemical Warfare Department of the U. S. Army as a captain in both the European and Pacific theaters. Afterwards, he returned to Armstrong, holding the position of assistant to the chief chemist until October 1952, when he was promoted to compounding manager. Mr. Connell was a member of the American Chemical Society and, at the time of his death, was serving as chairman of the Southern Rubber Group. He was also a past High Priest of the Royal Arch Masons of the Natchez chapter. He is survived by his wife and two sons.

### *Edgar H. Wilson*

Edgar Hunt Wilson, founder and former president and general manager of the Dural Rubber Co., Flemington, N. J., died on December 9 at the Hunterdon Medical Center after a long illness. He was 64 years old. Mr. Wilson also founded E. H. Wilson Associates of Trenton, N. J., a concern specializing in contracting and engineering services and he was a former executive of the Eastern Construction Co., also of Trenton. A thirty-three degree Mason, Mr. Wilson had served as Grand Chaplain of the Grand Lodge of Masons of New Jersey.

### *James C. Clinefelter*

James Claude Clinefelter, associated with John Royle & Sons of Paterson, N. J., as a sales engineer since 1929, died on December 11 at the Akron General Hospital, Akron, Ohio. Mr. Clinefelter, who was born in Princeton, Penna., had been in Akron working in the machinery business for 36 years. Before joining John Royle, he was an engineer with the Old Portage Rubber Co. and was with the Akron Standard Mold Co. and Akron Rubber Machinery Co. He held several patents in rubber machinery and processing methods.

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# Overseas

*by Comtel-Reuter*

**Colombo**—Ceylon and Communist China have signed an agreement on the 1957 rubber for rice exchange. Under the agreement, China will receive 50,000 metric tons of rubber in return for 270,000 metric tons of rice. Rubber traders in Colombo stated that the terms offered by the Chinese were "generous" considering that sheet rubber was already available to China from Malaya.

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**Ibadan** (Nigeria)—In response to requests by rubber exporters, the Products Inspection Board is now allowing exporters recommended by the Western Region Produce Inspection Advisory Committee to grade their own rubber according to accepted standards. Such exporters are exempted from the relevant rubber export regulations although the Produce Inspection Service retains the right to spot check any rubber for export.

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**Birmingham**—The experimental production of synthetic rubber on an appreciable scale is soon to begin for the first time in the United Kingdom at a new £600,000 plant of the Dunlop Rubber Co. The firm states that the plant is the advance guard of synthetic rubber production in Great Britain. Plans are to produce 1,500 tons of synthetic rubber annually, most of this of the GR-S type.

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**Singapore**—Many observers state that it might pay the Malayan rubber industry—after investigation of doubts about fair examination and arbitration at ports of destination—to press the Rubber Export Registration Board to employ permanent arbitrators of its own in London and New York.

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**Milan**—The Pirelli Co. has stopped making pneumatic racing tires in order to devote its time to the development and production of passenger and airplane tires.

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**Osaka**—Imports of high tenacity rayon yarn for use in tire production are to be allowed into Japan from the United States to relieve an acute shortage, according to the Japanese Chemical Fibre Association. The shortage is a result of active demand from both domestic and overseas consumers. The Association said the Ministry of Trade would approve imports of 1,070,000 pounds of yarn as an emergency measure.

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**London**—Dunlop Rubber Co. has announced a 10% price increase on all its tires. The increase is attributed to rising costs of production brought about particularly by the increased price of rubber.

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**Djakarta**—The Ministry of Agriculture has announced that an International Rubber Conference will be held in Indonesia next June under the auspices of the Indonesian Government and the International Rubber Study Group. A number of international bodies will be invited to participate in the conference.

**Bonn**—Chemische Werke Huels has set up its first subsidiary abroad, the Quimica Industrial Huels do Brasil, Ltd., at Sao Paulo, Brazil. Chemische Werke is the sole producer of synthetic rubber in West Germany. The new subsidiary will deal with the production and sale of chemical goods and may also acquire an interest in foreign firms.

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**Enugu** (Nigeria)—A £3,500,000 rubber project has been launched in Eastern Nigeria by the Dunlop Nigerian Plantation Co., Ltd. Some 20,000 acres of land have been acquired for the purpose. A small area of about 80 acres has already been planted. High yielding rubber seeds are being imported from Malaya, the Belgian Congo and Liberia.

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**London**—A spokesman for the Board of Trade has indicated that the British Government will consult with the Malayan Government before arranging its import program for synthetic rubber for 1958. The program for 1957 imports—totaling 87,000 tons, was discussed with Malaya before it was announced in Britain, the spokesman disclosed.

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**Kuala Lumpur**—The Rubber Goods Manufacturers Association of Malaya has urged the Government to negotiate with British authorities for imperial preference for rubber-canvas footwear and other goods exported to the United Kingdom. It was stated that these goods should qualify for imperial preference since more than 50% of the cost involved was made up of Malayan workmanship and rubber.

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**Bonn**—The West German Economics Ministry has announced another extension of the West German free list for imports from OEEC countries, bringing the rate to 100% for some industrial goods and raw materials. Among the items for which liberalization was announced are tires and tubes.

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**Singapore**—The leader of the Singapore Trade Mission to China and Japan advises that eleven Japanese rubber factories will send a mission to Singapore and the Federation of Malaya to study Malaya's rubber industry. The mission was to arrive early in 1957.

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**Kuala Lumpur**—Malaya's 320,000 rubber plantation workers have received a 33 Straits cents a day wage increase for 1957 as a result of the steady increase in the price of rubber over the past three months. Under the agreement with the Malayan Planting Industries Employers Association, pay rates are fixed according to the average rubber price during the previous quarter. The new increase will cost the industry 8,000,000 Straits dollars during the January-March quarter of 1957, the trade estimates.

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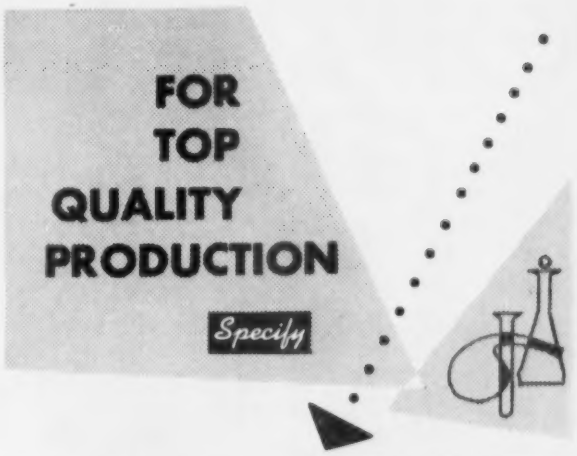
**Singapore**—A spokesman for the Singapore Trade Mission has stated that China's potential consumption of rubber was considerable and was the new hope for Malaya's natural rubber industry. He observed that China will require in the next few years several times the estimated 100,000 tons of rubber she consumed annually for her expanding rubber goods manufacturing industry.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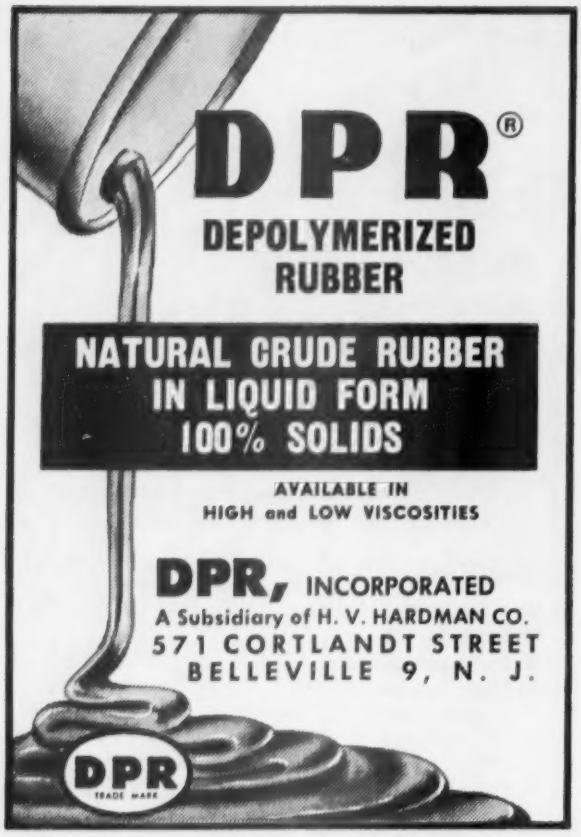
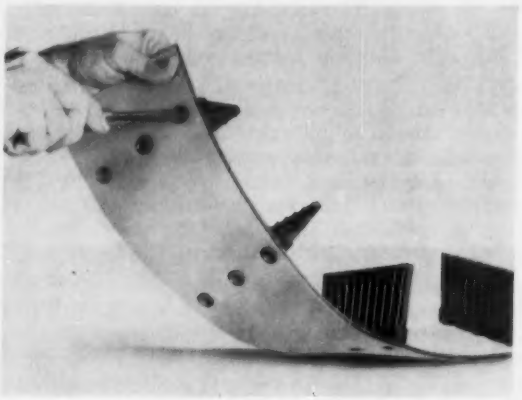


# New Goods

## Screw-On Conveyor Belt Cleats

Molded neoprene screw-on cleats that will convert any conveyor or elevator belt into a cleated belt are now available from T. H. Hinchcliffe, 1450 La Loma Road, Pasadena 2, Calif. Though originally designed for the food industry, these neoprene cleats, called "Tatch-A-Cleat", are finding many other industrial uses. The ease with which they are removed and replaced, makes possible the use of differing heights and widths depending upon the use intended. Specially constructed screws, washers and inserts, prevent the screw heads and washers, that attach the cleats to the belt, from coming in contact with the pulley. Tatch-A-Cleats are resistant to oil, heat, mild acids and weather conditions, the company says. Stock heights from 5/8 inch to 3 inches and widths from 1¼ inches to 24 inches are available. Unusual widths, heights and rib structures may be manufactured according to specifications.



## One-Piece Pressure Seal

A one-piece pressure seal, the "Dyna-seal," manufactured by the Precision Rubber Products Corp., 3110 Oakridge Drive, Dayton, Ohio, is said to be the answer to leakage problems created by face-to-face sealing in many commercial and industrial applications. The new sealing device is adaptable to sealing under bolt heads, abutment flanges such as the pipe union, or similar flanges that require sealing between two faces with the bore open to pressure. The Dyna-seal consists of an inner sealing member made of Hycar American rubber, heat- and pressure-bonded to an outer confining steel ring or washer. The device supplies a positive lock washer action and effectively seals pressures up to 10,000 psi against air, water, all types of petroleum products, and many industrial gases and chemicals, the company states. The seals function in a temperature service range from —65°F. to +250°F. The inner sealing Hycar member has a unique shape or flare. When compressed, the resilient sealing lips of the member form a convex surface opposing the steady or pulsating pressure, giving the positive seal. Dyna-seal re-use is possible, the initial cost is low, and the seals are easily installed, the company reports. They are manufactured in sizes ranging from 1/8 to 1¼ inch.

## Sealdbin Industrial Container

"Sealdbin" an air-tight shipping container for bulk packaging carbon black and other flowable materials, has been introduced by the U. S. Rubber Co., 1230 Avenue of Americas, New York 20, N. Y. The container, which is made of black neoprene, needs no protection against weather, is collapsible for return, hermetically sealed and economical, U. S. Rubber states. Built somewhat like a tire with two or more plies of high strength tire cord

and synthetic rubber, Sealdbins are molded together in a high pressure vulcanizer to form the tough outer shell. Additional reinforcing plies of rubber and cord are used in areas where greater stress may occur. A metal lift eye in the center of the top of the container, with several flexible steel cables extending to fittings around the bottom enable the container to be hoisted and handled after it is filled. The company manufactures 50, 70, 300 and 370 cubic-foot sizes. A 300 cubic foot Sealdbin holds an average of 9,000 pounds of carbon black, for example, replacing as many as 240 paper bags holding 50 pounds each. A Sealdbin unit containing carbon black is shown above in a typical operation.

## Goodrich Jet Aircraft Hose

The production of a jet aircraft hose, designed to withstand both the super-heated temperatures met in supersonic flight and the frigidity of Arctic climate, has been announced by the B. F. Goodrich Industrial Products Co., Akron, Ohio. The special hose will be manufactured under a license agreement with the Resistoflex Corp., Belleville, N. J. Said to have the widest useful temperature range of any flexible material, the hose remains strong and flexible at temperatures as low as —100° F. and as high as 450° F. The hose will be used for fuel, lubricant and hydraulic lines in jet and conventionally powered aircraft as well as in rockets and guided missiles. Inert to chemical attack, the hose will conduct all the new synthetic lubricants needed for the higher operating temperatures found in the new high-altitude aircraft. It will also handle the new, more powerful corrosive fuels required for advanced aircraft and missiles. The hose weighs about half as much as conventional aircraft hose and consists of a seamless tube reinforced with braids of stainless steel wire for strength and resistance to corrosion. The basic material from which the tube is made is Teflon tetrafluoroethylene.

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Cured & Uncured
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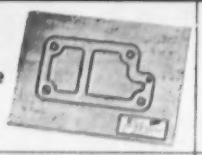
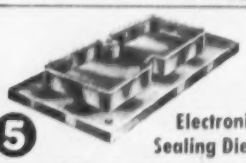
3 Mallet Handle Dies

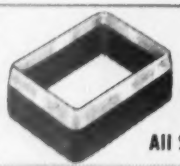


4 Steel Rule Cutting Dies

2 Steel Rule Clicker Dies



5 Electronic Sealing Dies



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Bulletin 194-S gives details of these instruments.
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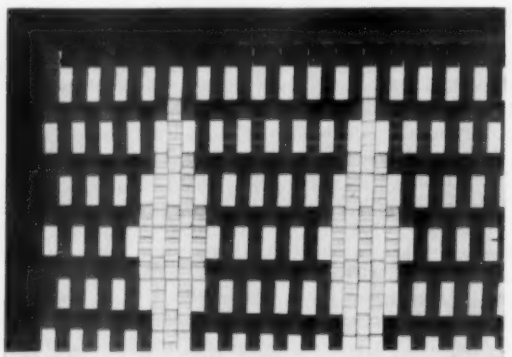
## Rigid Vinyl Relief Map

A new relief map of the world, lithographed in ten colors and showing nearly 3,000 place names, has been framed from Bakelite rigid vinyl sheet by Aero Service Corp., 210 E. Courtland St., Philadelphia 20, Penna. The three-dimensional representation is a large 61- by 42-inch self-framed map weighing only two pounds. This

is the largest in a series of relief maps produced by Aero Service, which have included all the latest geographic and political information as well as time zones and other data. The maps are light in weight, durable and easily cleaned, which makes it possible to mark temporarily significant areas. These maps are made by vacuum forming. The photograph above shows a typical relief map produced by Aero Service.

## Multi-Link Koroseal Matting

Custom-made multi-link matting made of vividly colored Koroseal links has been introduced by B. F. Goodrich Industrial Products Co., Akron, Ohio. The links, which are closely spaced to prevent women's heels from catching in them, are strung on parallel, non-rusting spring steel rods. The mats are finished on all four



sides with Koroseal nosing, which may be either square or tapered, and corners are heat sealed. According to the company, the links won't stain, discolor, or fade with time and they resist aging abrasion, acids, caustics and oil. They are available in any combination of gray, brown, blue, yellow, black, green, white, red and orange. A four-page catalog folder that describes and illustrates the matting may be obtained by writing to the company.

## H R Series Fog Nozzles

Bete Fog Nozzle, Inc., Greenfield, Mass., has introduced a new line of hard rubber fog nozzles, called the "H R Series", which are said to be non-clogging, corrosion resistant with practically any spray, immune to most chemical substances, long-wearing and inexpensive. The H R Series nozzles utilize the manufacturer's exclusive spiral design and are of one piece, non-clogging construction, the company says. They are available in ten models with narrow angle (50°) or wide angle (120°) hollow cone spray pattern in five different flow rates from 5 to 50 gpm. The thread connection for the smaller sizes is ⅜ inch male pipe thread, ½ inch male pipe thread for the larger sizes.

## Fairprene Tarpaulin Fabric

Fabrics Division of E. I. du Pont de Nemours and Co., Wilmington, Del., has introduced a new tarpaulin material which provides improved abrasion resistance in combination with lightness through the use of a coating of Hypalon synthetic rubber on the underside. The exterior surface is coated with black neoprene, which is noted for excellent weathering properties. The Hypalon surface is gray. Named "Fairprene 5787", the new tarpaulin fabric has demonstrated in service tests that it is more resistant to wear inflicted by rubbing against cargo or vehicle; rot and mildew resistant; its water absorption is virtually zero and it remains pliable in subfreezing temperatures. A tarpaulin of this type may be stored wet without damage. Improved Fairprene No. 5787 weighs 14 ounces per square yard and is available in 42-, 54-, and 72-inch widths. DuPont manufactures only the coated fabric, not the finished tarpaulin.

## Fire Engine Booster Hose

Thermoid Co., Whitehead Road, Trenton 6, N.J., is now producing a new fire engine booster hose packaged in cartons. Manufactured with a two-braid rayon reinforcement, the "Red Devil" hose is designed for a working pressure of 800 psi. It is available in two sizes—¾ inch and 1 inch ID. The hose is sold coupled with chrome-plated Bar-way couplings in 50 foot lengths in cardboard cartons for convenient stocking. The new hose is also available in lengths up to 250 feet. A red neoprene cover is compounded to resist abrasion and the harmful effects of oil, grease, sunlight and checking, the company reports. Special carcass design limits contraction under pressure to a minimum to insure safe reel operation.

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Connect to compressed air line 30 to 50 psi. Handles discharge heads up to 100 ft., with maximum suction 20 ft. Pump is self-priming, may be installed above level of liquid pumped. Can be furnished in special alloys for pumping corrosives. Sizes: 1½", 2", 3", 4", 6".

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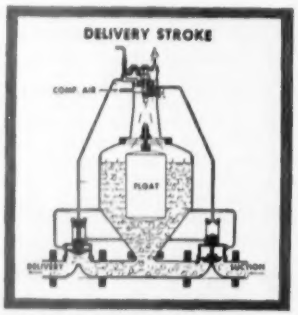


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# Ejectopump

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## New Equipment

### Cleveland Top Entering Mixers

A line of six top entering mixers, called the K Series, has been announced by the Cleveland Mixer Co., Box 197, Bedford, Ohio. The units feature a two-stage helical gear reduction that is AGMA rated. Double and single reduction are said to be easily interchangeable. The first stage static-free V-belt reduction provides simple speed changes, and infinitely variable speed is easily arranged. The load is transmitted to the agitator shaft by means of a roller chain flexible coupling. No eccentric or shock load is transmitted to the gears, according

to the company. The agitator shaft is supported by the upper thrust bearing which is anti-friction and self-aligning. The "gland-a-line" radial bearing is part of the stuffing box or mechanical seals and allows no run-out. The spring-loaded lubricating gland provides constant pressure on the packing rings. The company reports that any standard motor can be used on the mixers. Impellers will be furnished with the unit dependent on service as to number, type, size and materials. The mixers, according to the company, can be furnished for full outdoor operation if required. Constructed of steel, the units are available in a wide range of horsepower and output speeds.

### Sparton Remote Proportioning Control System

A remote proportioning control system offering good flexibility in meeting remote process supervision problems has been developed. The Sparks-Withington Co., Jackson, Mich., states that their system, over one circuit, both controls pilot proportioning operators and continuously monitors the changes produced. Adaptable to a variety of needs, the central system, which features package "building block" construction, is available with or without transducers for telemetering such functions as pressure, flow, water level, pH factor, power, speed, phase shift, position and electrical quantities. It may be used in conjunction with existing operators or can be supplied complete with reversing motors and pilot operators up to several horsepower.

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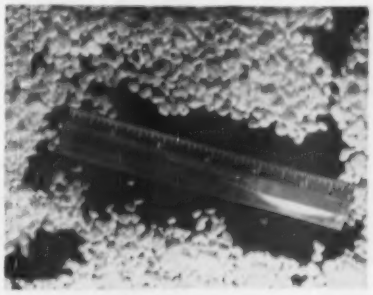

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Additionally, protective packaging seals out dust and moisture. All of this means you get the important qualities in magnesia for neoprene compounding without paying a premium. Ask for a sample today. Test and you'll know. Write:

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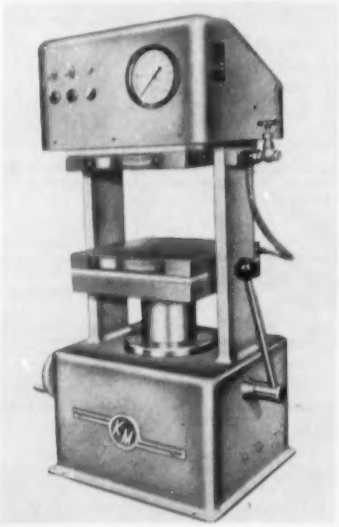
## Larger K-M Hydraulic Presses

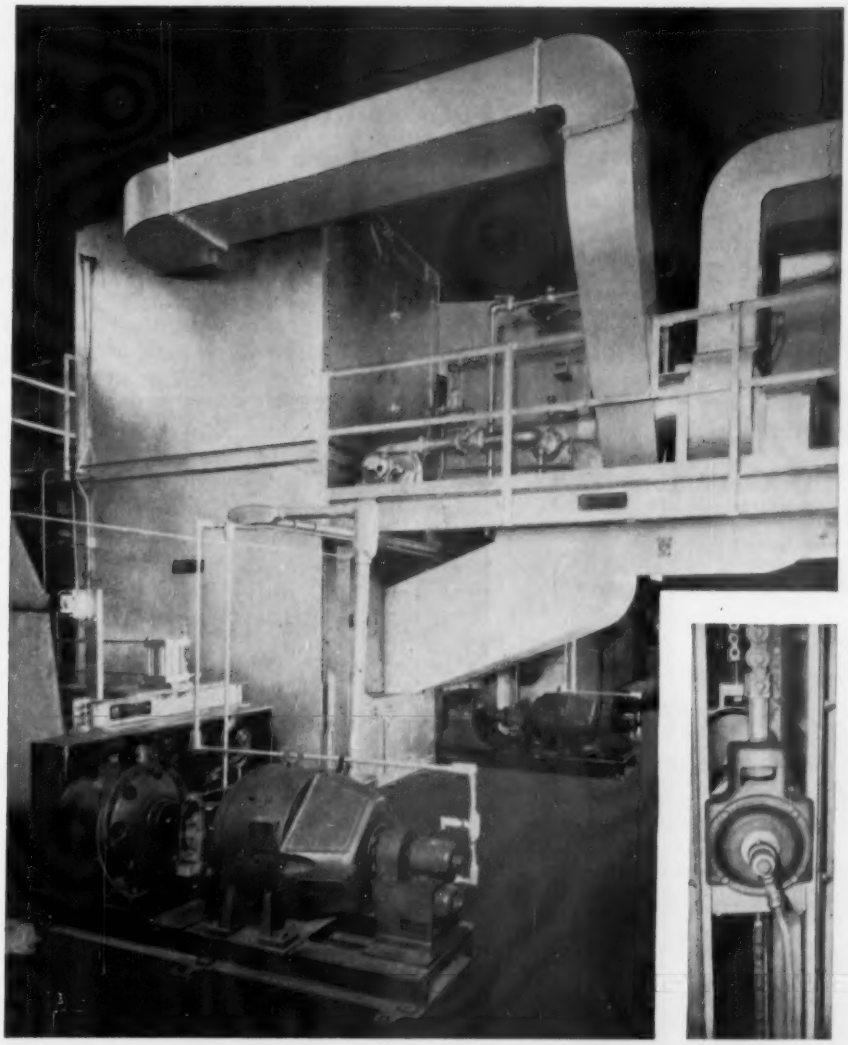
Especially useful for rubber and plastic molding are a pair of new hydraulic presses added recently to the line of Kingsbacher-Murphy Company, 6245 Lexington Ave., Hollywood 38, Calif. The new 30- and 50-ton models are also applicable for testing and for all types of laminating whether on a production or laboratory basis. The presses feature a 5-inch ram and a 5-inch stroke, and develop up to 60,000 and 100,000 pounds pressure on the platens, respectively. The precision-ground platens are made from a special semi-steel and are available in both 12½ x 12½-inch and 12½ x 18½-inch sizes. Cast-in heaters made to operate on 220 volts A.C. permit heating up to 600°F. The temperature, accurately controlled by means of individual adjustable thermoswitches, is indicated by thermometers located on the front edge of each platen. In addition, the platens contain coils for water cooling and can be adapted for steam heating. Both the temperature and pressure are uniformly distributed throughout the working area.



The hydraulic system features a two-stage pump, automatically switching from low to high pressure, and a newly designed release valve, both of which contribute to faster and easier operation. Each platen has its electrical components mounted on a separate chassis inside the cabinet. These parts are easily accessible for immediate inspection and servicing through a hinged door. The space between columns measures 13¼ inches, allowing for the use of large molds and dies, and models are available with single and multiple openings. Having a frame of welded steel, the press has a maximum of strength, yet requires a minimum of floor space. It is a very compact unit, delivered complete and ready for immediate use without any complicated installations.

---

Clifford B. Hannay & Son, Inc., Westerlo, N. Y., has introduced a **hose reel** with a newly designed compressed air rewind for fuel delivery and other industrial uses. A "one-finger" control lever stops the reel at any time during rewind. The unit is designed to handle hose up to 3 inches I.D.



Within the first day of startup, full width nylon tire cord processed in this 30-yard-per-minute, 14,000-pound-tension **IOI** Rollevator® Oven*, was made into aircraft tires meeting all qualification tests.



The Rollevator® roll automatically moves up and down within the oven, in direct relation to line speeds. Thus, at *any line speed, heat-exposure* time of the nylon is held *constant* at a constant temperature setting and at constant tension.

# Rollevator® Oven* hot stretches nylon tire cord at constant optimum temperature, constant time and constant tension, at variable line speeds

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## Wohler Foam Compression Tester

Precise compression modulus readings on all types of foam cushioning materials can be obtained in standard RMA-ASTM figures with a new portable foam rubber compression tester marketed by the Browning Instrument Co., P.O. Box 152, Bath, Ohio. The Wohler Foam Tester utilizes the industry standard 50 square inch compression foot and specially designed disc weights. The instrument tests all cored foam products up through double mattress size, including reversible

furniture cushions, and has a maximum compression range up to 42½ pounds. It also can be used for low temperature testing in conjunction with a cold box, and to determine compression fatigue or drift as well as hysteresis properties. Additionally, it provides a simple, convenient way to measure the exact height of cushions or mattresses for specification control or measurement of sag if present after service. The tester is designed to operate through a tiny non-damaging incision in the top slab of the cushion and fixed weights provide a reliable compressing force. No calculations are required since cushion height and deflection are indicated automatically on separate, easy-to-read scales.

## Hull-Standard Plastic Molding Presses

All-electric drive, safety interlock system and a quick-set sequence automatic cycle control are features of a new line of fully-automatic, high speed compression molding presses for the plastics industry recently introduced by the Hull-Standard Corp., Abington, Penna. The complete dry cycle time is 12 seconds, not including the "slow close" adjustment, which gives a range of closing speeds to meet plasticizing time requirements for various materials. According to the manufacturer, the automatic operation of the press makes it possible for one man to handle as many as ten machines at one time, since he is needed only to refill hoppers and take away containers of finished pieces. If desired, however, any machine in the new line may be operated as a semi-automatic press for purposes of trying out and breaking in molds and for production of smaller or sample lots. The hydraulic toggle action of the new presses, with its high-speed circuit, requires only a 3 hp motor and provides minimum opening and closing time.

A full port, normally closed, **packless solenoid valve,** which does not require back pressure for efficient operation, has been introduced by the Magnatrol Valve Corp., Hawthorne, N. J. Type A, featuring a unique removable operating assembly, automatically controls flow of water, oil, brine, solvents and gas or air at fluid temperatures up to 212°F.

Two new types of **universal cylinder mountings,** designed to eliminate misalignment problems between cylinders and their work loads, have been developed by Hanna Engineering Works, 1765 No. Elaston Ave., Chicago 22, Ill. Two forms are available—a hinge mount cylinder with universal mounting brackets at each end and a cylinder with universal mounting bracket for the rod end.

A complete line of **small solenoid pilot valves,** capable of handling air, vacuum, oil, water and inert gases, has been announced by the Valvair Corporation, Akron 11, Ohio. Available in both two and three way types, the new valves are designed for control of Speed King remote pilot-operated valves or direct control of small cylinders and similar devices.

## Symposium on Softeners for Compounding

*(Continued from Page 682)*

***Answered by Dr. Kurtz:*** For the oil portion of this system, the aromatic type oils are ruled out because of their staining tendencies, particularly where white side walls are involved. This leaves a choice between naphthenic and relatively paraffinic oils. Circosol 2XH, our naphthenic oil, has been widely used for this purpose with entirely satisfactory results. It will incorporate in the rubber faster than the relatively paraffinic types. If SBR rubber is blended with natural rubber, tack can be obtained by giving the natural rubber a little extra breakdown. Staybilite resin, a rosin derivative, aids tack. For extreme resistance to staining, where processing is no problem, a paraffinic oil is recommended (V.G.C. 810 to 820). Process Oil 551 and Sun Process Oil 515 are examples.

***Answered by Mr. Amberg:*** I would not hesitate to recommend the use of a stabilized rosin, either alone or in combination with other types of softeners, in mixed natural and synthetic rubber.

**Question:** Would the panel recommend a tread splicing cement for treads made from oil-extended cold rubber (e.g., 1712) and high black loadings.

***Answered by Dr. Kurtz:*** A cement made from a natural rubber tread compound cut back with a solvent to give a suitable consistency is recommended. To get good tack, a little extra milling will help, but too much milling will give a weak cement. We understand that one or two companies have made some use of synthetic rubber cements for tires. In regard to the oil used, paraffinic oils will reduce tack and thus would have an adverse effect on splice performance; naphthenic oils or aromatic oils are satisfactory.


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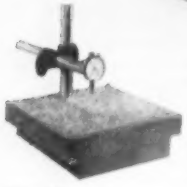

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# Reviews

## BOOKS

**Lange's Handbook of Chemistry.** (Ninth Edition). Published by Handbook Publishers, Inc., Sandusky, Ohio. 5⅛ x 7¾ in. 1985 pp. $8.50.

This invaluable reference volume for all requiring ready access to chemical and physical data used in laboratory work and manufacturing has been revised and brought up-to-date in this, its ninth edition. Many of the tables have been completely rewritten and much new information has been added. For example, the ninth edition now contains data on the properties of plastics as materials of construction, fundamental constants for physical chemistry, a viscosity comparison chart, hydrometer scales comparisons, and much more. Formula weights of inorganic compounds and gravimetric and volumetric factors have been computed to conform to the latest international atomic weight values. In total, the handbook undertakes to cover such subjects as the elements, inorganic compounds, organic compounds, and analytical, physical and industrial chemistry. Of particular interest are charts showing formulas of typical synthetic rubbers, thermoplastic materials, etc., and a chart showing the properties of natural and synthetic rubbers. Special care has been taken in compiling the comprehensive index and in furnishing cross references with many of the tables. Of convenient size, the handbook is durably bound for hard usage. Excellent typography contributes to the usefulness of the volume.

•

**Glossary of Terms Relating to Rubber and Rubber-Like Materials.** (Special Technical Publication No. 184). Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna. 6 x 9 in. 121 pp. $3.00 (non-members), $2.25 (members).

This glossary was assembled by a group of five members of ASTM Committee D-11 on Rubber and Rubberlike Materials and represents a concentrated effort to assemble, between two covers, major terms, phrases and trade names in current use. The end result is a glossary of great utility, one which combines easy readability and clarity of expression. Great pains have been taken to clarify and simplify and, in some cases, diagrams are furnished to indicate chemical structure. The technical life of any industry is always encumbered by word structures and phrases which have come to mean different things to different persons. The virtue of a good glossary is that it standardizes, explains and instructs. This new glossary meets these needs and will prove a valuable addition to the family of reference works utilized by the rubber industry.

•

**Directory of New England Manufacturers: 1957.** (21st Annual Edition). Published by George D. Hall Co., 20 Kilby St., Boston 9, Mass. 8 x 11 in. 776 pp. $40.00.

Published with the editorial cooperation of the New England Council, this directory lists 13,000 New England manufacturers, 25,000 top ranking executives, 3,000 products and services and 3,700 brand names. Manufacturers are listed alphabetically, geographically, by products manufactured and by brand names. The Alphabetical Section includes company name and address, executive personnel, products manufactured, number of employees and capital rating. The Geographical Section lists manufacturers first by state, then by city or town, noting beside the company name the products manufactured. The Product Section lists the classifications alphabetically, and under the classifications the company and city and state where the manufacturer is located. The Brand Names Section lists the brand or trade names used by New England manufacturers.

**Lehrbuch Der Organischen Chemie (Textbook of Organic Chemistry).** By Paul Karrer. Published by Georg Thieme Verlag, Stuttgart, Germany. 7½ x 10½ in. 949 pp. 12th Edition, 1954. Price DM59.70 ($14.20). (In German).

The author stated in the preface to the first edition (published in 1927) that university students of organic chemistry are finding it increasingly difficult to acquire an over-all view of the growing accumulation of facts in the field of organic chemistry, and that it appears necessary to acquaint young chemists with methods of synthesis and determination of the chemical constitution of organic compounds in such a manner that they should be able to orient themselves later in fields outside their own specialization. If this statement was valid in 1927, it certainly holds true today. Although the general organization follows the one used in the first edition, the current edition has been revised and enlarged to bring the student up to date on modern theories and hypotheses. However, throughout the book emphasis is placed on the fact that experimental evidence obtained through analysis and synthesis is the most reliable basis for chemical research.

In line with his aim, Karrer organized his textbook following the classic and time-tested system in the three main chapters "Aliphatic Compounds," "Carbocyclic Compounds" and "Heterocyclic Compounds," adding a fourth chapter "Organic Compounds Containing Isotopic Elements." The three main chapters are subdivided by types and numbers of functional groups. This arrangement differs from that in many other textbooks. It places high-polymeric substances not in arbitrary groupings of similar physical characteristics, but where they logically belong. Cellulose, for instance, is discussed in the chapter on carbohydrates. Rubber is presented as a polymerization product of isoprene (hemi-terpene) in the chapter which also discusses sesquiterpenes, polyterpenes, sterols and vitamins. The constitution of rubber is explained on the basis of Harries' work, who showed that oxidation cleavage by ozonolysis gives laevulinic aldehyde, which proves isoprene as the monomer of the rubber molecule.

The book is exhaustively indexed (pages 893-949) and well documented by literature references. Several pages of tables, which appeared in previous editions as appendix, have been omitted from the current edition to provide space for the enlarged text. It is hoped that further editions will again include these tables, since they are believed to be very helpful in providing the broad over-all picture the author attempts to instill into students.

The only appended table in the twelfth edition is that of historical dates pertaining to important developments in organic chemistry. This reviewer is of the opinion that students would gladly swap the table of historical dates for some of those omitted, such as the previously given tables showing: number of structural isomers for compounds of same molecular formula, identification of odors, minimal effective concentrations of perfumes, tolerance limits of poisons, pH intervals of indicators, etc. This criticism of the book is only minor.

"Karrer" is one of the most outstanding modern textbooks of classic organic chemistry. Its wide acceptance is evidenced by the fact that twelve editions have been published since 1927 and that "the Karrer" has been translated into English, French, Italian and Spanish, and a Japanese edition is, according to the publishers, in preparation. Although Karrer's textbook was primarily designed for teaching, it deserves a place in every organic chemistry library alongside other well known standard texts.

F. R.

•

**Plastisol Molding.** Watson-Standard Co., 225 Galveston Ave., Pittsburgh 30, Penna. 8½ x 11 in. 4 pp.

Reprinted from *Modern Plastics*, this four page bulletin is concerned with the various techniques employed in molding plastisols. A discussion of what a plastisol is and a listing of physical properties of the compounded material is followed by a discussion on dip, slush, rotational and low pressure injection molding. Photographs show items that can be produced by the various molding techniques. The discussions include information on the methods used in each type of molding and how and where the particular method may be employed.

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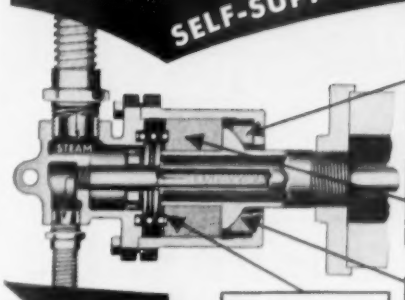


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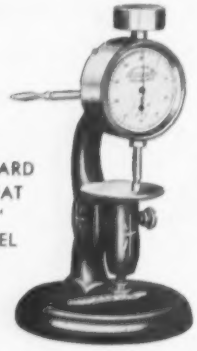

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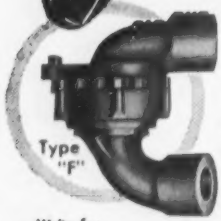


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## BOOKLETS, CATALOGS, etc.

**Kesscoflex Plasticizers.** Kessler Chemical Co. Inc., State Road & Cottman Ave., Philadelphia 35, Penna. 8½ x 11 in. 56 pp.

This catalog concerns fifteen of the firm's plasticizers, presenting physical properties, formulas and comparative performance data for each. Recommendations are given for their use with cellulose resins, polystyrene and synthetic rubber. Charts and graphs reflect solubility, resin compatibility and viscosity-temperature relationships, and test methods are outlined. Data for performance with polyvinyl chloride includes efficiency concentration, modulus, tensile strength, elongation, shore hardness, brittle temperature, volatility, and extractions pertaining to mineral oil, gasoline or 1% soap solution.

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**Twenty-Five Questions Most Frequently Asked about the Microlimit Control.** (Bulletin No. 1-56). Industrial Gauges Corp., 44A Grand Ave., West Englewood, N. J. 8½ x 11 in. 6 pp.

Covering the economics of insulated wire diameter control, the equipment, its operation and maintenance, this pamphlet answers the bulk of the questions management must resolve in deciding the value of automation in their insulating processes. Answers to such questions as: What is it? How does it operate? What are the advantages over contact gauges? What is involved in the installation? How is it operated? What maintenance is involved? What economies does it offer? as well as others are contained in its pages.

•

**CRV Cradle-Mounted Type Pumps.** (Form No. 7223-B). Cameron Pump Division, Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y. 8½ x 11 in. 24 pp.

This bulletin covers the complete line of class CRV cradle-mounted centrifugal pumps manufactured by Ingersoll-Rand. Pumps described have capacities from 5 to 2800 gallons per minute and pressures of 10 to 525 feet total head. A concise tabulation of pump types with their rating is included. A cross-sectional view points up the design features common to this line of pumps. Typical installation views of the models are shown. In addition, performance tables and dimensions for the entire line are given.

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**Injection Molding of Cycolac.** (Technical Report No. CY-3). Marbon Chemical Division, Borg-Warner Corp., 7165 Chicago Ave., Gary, Ind. 8½ x 11 in. 8 pp.

Cycolac, a thermoplastic multi-polymer, is described in this report with particular reference to its use—in pelletized form—in injection molding. Comments are given on the general characteristics of drying procedure involved in Cycolac compounds. Construction and design of molds and gating are discussed. Proper molding temperatures and the factors affecting them are presented. Ram operation, purging, and molded properties complete the material under consideration in the report.

•

**Scott Tester Model CET.** Scott Testers, Inc., 101 Blackstone St., Providence, R. I. 8½ x 11 in. 6 pp.

The new Model CET in the line of Scott testing machines is described in this folder. How the instrument is utilized in tensile, compression and hysteresis test in the 0 to 2,000-pound range is outlined. Detailed data includes capacity, stroke and test area, speeds, recording, dimensions and options. Graphs on magnified stretch, variable speeds, selective picturization, infinitely variable load, cyclic loading and compression tests are presented, as well as an illustration of the CET.

**Dresinol Resin Dispersions.** Hercules Powder Co., 9th and Markets Sts., Wilmington 99, Del. 8½ x 11 in. 20 pp.

The use of Dresinol resin dispersions in conjunction with GR-S type latex to improve properties and lower costs in a variety of applications is described in this new technical booklet. Detailed data are presented illustrating the properties contributed when the dispersions are used to modify GR-S, neoprene, natural rubber and polyvinyl acetate. The booklet includes ten tables, the first of which gives data aiding the selection of properties best suited to specific applications. The remaining tables, with data developed in studies of Dresinol dispersions in emulsions with the four aforementioned types of materials, are organized under three headings: Emulsion Properties, Dry Film Properties and Adhesive Properties. A discussion precedes the tables in order to clarify the presentation of the data.

•

**Link-Belt Company Directory.** (Book No. 2653). Link-Belt Company, Prudential Plaza, Chicago 1, Ill. 8½ x 11 in. 44 pp.

This brochure is a directory of the firm's standard products, engineered equipment, and manufacturing sales and service facilities. It includes data on the Link-Belt line of conveyors built specifically for the rubber industry. Such conveyors include those for carbon black handling systems, tire production, and others for transporting rubber in its various stages of production. Equipment illustrations are presented. The brochure contains information on the company's research facilities as well as a list of available technical literature.

•

**Pratt & Whitney Rad-I-Acc Gages.** Pratt & Whitney Co., Inc., Charter Oak Blvd., West Hartford 1, Conn. 8½ x 11 in. 12 pp.

Non-contacting Rad-I-Acc gages, including x-ray and beta ray types, are described in this new circular. The principle of each type of gaging is outlined. Components are given, and engineering data are presented. The data includes thickness ranges for various materials. Rubber is listed under the beta ray gage, which is designed for non-metallic materials. Control units for mill control, classifying, and production analysis, used in combination with the gages, are also detailed. Illustrations complete the booklet.

•

**Vistanex.** Butyl Division, Enjay Co., Inc., 15 West 51st St., New York 19, N. Y. 8½ x 11 in. 18 pp.

A new brochure is offered on the Vistanex isobutylene polymers in the LM grades, Types MS and MH. Discussion is devoted to chemical resistance and solubility to various chemicals, as well as to electrical properties and resistance to water absorption. Applications described include hot-melt laminants and heat-sealable coatings, emulsions, adhesives, caulking and sealing compounds, chewing gum base and asphalt-Vistanex paints. The brochure includes typical formulations for the various applications and lists materials to which Vistanex is said to give good adhesion.

•

**Catalin Antioxidant AC-1.** Catalin Corporation of America, 1 Park Ave., New York 16, N. Y. 8½ x 11 in. 8 pp.

The physical properties of Catalin AC-1, a relatively new antioxidant for the rubber and other industries, are outlined and discussed in this bulletin. According to the bulletin, the new antioxidant finds application with such rubber products as white sidewall tires, packings and gaskets, water-dispersible rubber compounds, pressure-sensitive tapes, and insulation. It is said to be especially useful in compounds where the rubber will contact light enamels or lacquers because of its non-staining properties. A brief dissertation on the oxidation mechanism is included in the bulletin.


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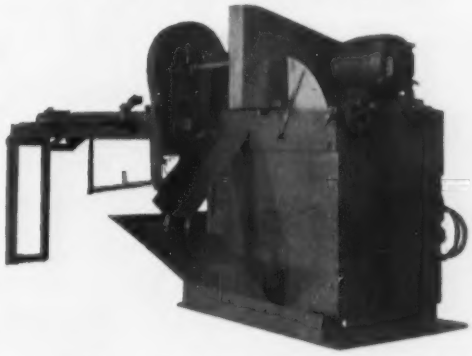

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# MARKET REPORTS

TRENDS
NEWS
PRICES

## Natural Rubber

Since our last report (November 30), the price of spot rubber on the New York Commodity Exchange has moved in a range of 162 points, high for the period being 37.75c reached on December 3 and 26, and low being 36.13c reached on December 19. The average price of spot rubber for the month of December was 37.01c based on 19 trading days. This compares with an average of 35.18c in the previous month.

News of China's latest barter pact with Ceylon shows that China is anxious to keep open its supply line of natural rubber; it is believed that Chinese tire production will increase rapidly this year on the basis of natural rubber.

Rubber traders in Ceylon describe the terms of the latest agreement as generous to Ceylon. For the 50,000 tons that the Chinese will buy this year, the floor price will be above world levels even though the premium over last year's price has been reduced.

This is the final year of the five-year barter arrangement between China and Ceylon. Though China has recently resumed rubber buying in the Singapore market, she has shown that she requires a guaranteed source of supply other than Malaya.

### Suez Canal Situation

Meanwhile, it is reported that the closing of the Suez Canal will mean a reduction of something like 20,000 tons in British and European rubber imports. Traders are generally confident, however, that once the Cape route trading pattern settles down, more rubber will be shipped each voyage to make up for the 10 to 14 days extra sailing time. The only difference in the post-Suez trading pattern, it is said, will be the increase in the supplies afloat compared with landed supplies. The latest stock returns from Britain show that current stocks are more than equal to the expected shortfall.

Some Continental countries will suffer more than others from the cut in supplies. In the case of Italy, for example, the sea journey will be the longest in Europe. France and Germany, however, are said to be holding stocks equal to about five or six weeks of normal consumption.

The rubber producing countries of the Far East have been exporting between two-thirds and three-quarters of their rubber shipments through the Suez and Mediterranean to Europe and the United States. Malaya, Ceylon and Indonesia sent about 1½ million tons through the Canal in 1955.

### Effect on U. S. Shipments

A large part of this total went to the United States and these shipments are expected to suffer least from the diversion around the Cape. The United States also draws supplies via the Panama Canal, but it is generally not expected that ships will be diverted to this route in preference to the Cape run.

The immediate effect of the Suez situation in Europe has been a demand for spot and nearby afloat supplies. Small premiums have been fairly general, and came as a result of buyers switching demands in order to get desired deliveries.

*NEW YORK, DECEMBER 31, 1956*

## Price Data

**Closing Rubber Prices on New York Commodity Exchange**

FROM DECEMBER 1 TO DECEMBER 31

| Dec. | No. 1 R. S. S. Spot | No. 1 R. S. S. Dec. | Rex Jan. | Rex Mar. | Rex May | Rex Sales |
|---|---|---|---|---|---|---|
| 1 | .... | .... | .... | .... | .... | ... |
| 2 | .... | .... | .... | .... | .... | ... |
| 3 | 37.75 | 37.00 | 38.15 | 38.00 | 37.80 | 282 |
| 4 | 37.00 | 36.30 | 37.10 | 37.00 | 36.80 | 189 |
| 5 | 37.50 | 37.00 | 37.90 | 37.75 | 37.45 | 312 |
| 6 | 37.00 | 37.10 | 37.20 | 37.15 | 36.65 | 214 |
| 7 | 37.50 | 37.50 | 37.65 | 37.55 | 37.05 | 199 |
| 8 | .... | .... | .... | .... | .... | ... |
| 9 | .... | .... | .... | .... | .... | ... |
| 10 | 36.75 | 36.55 | 36.75 | 36.65 | 36.25 | 246 |
| 11 | 36.63 | 35.95 | 36.45 | 36.55 | 36.01 | 260 |
| 12 | 36.25 | 35.50 | 36.05 | 36.00 | 35.75 | 198 |
| 13 | 36.50 | 35.90 | 36.40 | 36.40 | 36.05 | 170 |
| 14 | 37.00 | 36.30 | 36.95 | 37.00 | 36.65 | 134 |
| 15 | .... | .... | .... | .... | .... | ... |
| 16 | .... | .... | .... | .... | .... | ... |
| 17 | 37.00 | 36.40 | 37.15 | 37.20 | 36.75 | 52 |
| 18 | 36.63 | 36.40 | 36.70 | 36.80 | 36.40 | 114 |
| 19 | 36.13 | 36.00 | 36.20 | 36.30 | 35.95 | 43 |
| 20 | 36.63 | 36.00 | 36.70 | 36.70 | 36.30 | 58 |
| 21 | 36.63 | 36.00 | 36.70 | 36.85 | 36.30 | 182 |
| 22 | .... | .... | .... | .... | .... | ... |
| 23 | .... | .... | .... | .... | .... | ... |
| 24 | .... | .... | .... | .... | .... | ... |
| 25 | .... | .... | .... | .... | .... | ... |
| 26 | 37.75 | 37.50 | 37.80 | 37.70 | 37.15 | 242 |
| 27 | 37.63 | 37.00 | 37.85 | 37.75 | 37.00 | 205 |
| 28 | 37.50 | .... | 37.45 | 37.35 | 36.65 | 252 |
| 29 | .... | .... | .... | .... | .... | ... |
| 30 | .... | .... | .... | .... | .... | ... |
| 31 | 37.50 | .... | 37.50 | 37.35 | 36.62 | 61 |

### Outside Market

| | |
|---|---|
| No. 1 Ribbed Smoked Sheets: | |
| Spot | .37½ |
| January | .37⅜ |
| March | .37¼ |
| Thin Latex Crepe: | |
| Spot | .45 |
| Thin Brown Crepe, No. 2 | .32½ |
| Flat Bark Crepe | .24⅜ |

### London Market
(Standard Smoked Sheets)

| | |
|---|---|
| Mar. | 37.02 - 37.17 |
| Apr.-June | 36.73 - 36.88 |

### Singapore Market
(Standard Smoked Sheets)

| | |
|---|---|
| Feb. | 35.61 - 35.68 |

### Middling Upland Quotations

| | Nov. 30 Close | December 31 High | December 31 Low | December 31 Close |
|---|---|---|---|---|
| Mar. | 34.10 | 34.04 | 33.99 | 34.00 |
| May | 34.11 | 34.04 | 33.98 | 34.00 |
| July | 33.98 | 33.77 | 33.72 | 33.74 |

## Notes & Quotes

The business outlook for the rubber products industry is bright for 1957, according to Karl O. Nygaard, economist for the B. F. Goodrich Co. Mr. Nygaard states that general business in 1957 will show an increase over 1956. The Goodrich economist foresees a 10% increase in automobile production this year, some rise in truck output, and a steady growth in the replacement tire market. All this, he believes, gives the rubber products industry a bright outlook. As to the general economy, Mr. Nygaard sees a $9½ billion increase in consumer spending in 1957, a $3½ billion increase in business outlays for plants and equipment, and a $4 billion increase in government spending, with the gross national product reaching $430 billion.

## Synthetic Rubber

The Business and Defense Services Administration of the U. S. Department of Commerce reports that as a result of the Suez Canal crisis, a tight dollar supply may result in Europe and this will mean decreased purchases of synthetic rubber from the U. S. Consequently, the outlook for 1957 use of synthetic rubber in free Europe may not be as promising as it appeared earlier.

It is reported that stocks of synthetic rubber on hand in Europe are sufficient to permit consumption at present rates for over three months. "If reduced use of synthetic rubber does occur, it can hardly be expected before April," BDSA states.

A great many complicating factors other than the tight dollar supply enter into the use of synthetic rubber by European countries. British and Continental plants are not geared for an easy changeover to synthetic rubber. Moreover, European traders state that at this point price considerations have not developed into major factors on the side of synthetic rubber.

### Synthetic's Share Growing

It seems to be the consensus in the U.S. that synthetic rubber will take a larger share of total new rubber consumption in 1957 than in recent years. The domestic capacity to produce synthetic rubber is currently estimated at 1.3 million tons per year while the rest of the world can produce something like 130 thousand tons.

In many estimates for 1957, it was held that synthetic rubber exports from the United States in 1957 might hit a total of 300 thousand tons. If, however, foreign requirements do not develop as they were expected to, an interesting situation with reference to U. S. synthetic capacity might be in the making.

While present synthetic capacity in the U. S. is something like the 1.3 million tons mentioned earlier, expansion plans by many producers may bring this figure as high as 1.6 million tons by the end of the year. In 1956, the U. S. consumed about 1.45 million tons of new rubber and about 60% of this total, or 870,000 tons was synthetic rubber.

### Natural-Synthetic Use Ratio

If the synthetic-natural consumption ratio approximates the 60-40 basis which held in 1956, the U. S. will consume about 900 thousand tons of synthetic rubber in 1957 out of the total 1.5 million tons of new rubber estimated to be consumed. This leaves a gap between synthetic consumption and production of about 400 thousand tons, using present synthetic production as a base.

If earlier estimates hold and 300 thousand tons are exported, year-end stocks will total the remaining 100 thousand tons. If exports do not reach expectations, several possible conditions may develop: (1) A cut-back in synthetic production; (2) Very large stocks of synthetic rubber, or (3) Increased use of synthetic rubber in the U. S., with the synthetic natural ratio approaching a 70-30 level. All this, of course, is in the realm of conjecture—but 1957 should be an interesting year!

CYANAMID RUBBER

# Chem Lines

NO. 8
OF A SERIES

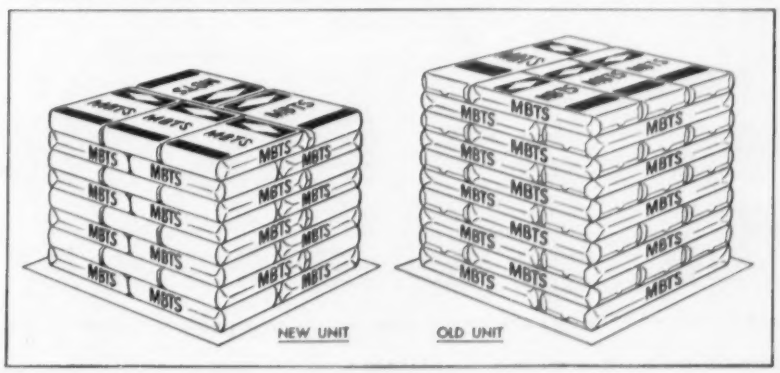
Published by AMERICAN CYANAMID COMPANY, Rubber Chemicals Department, Bound Brook, New Jersey

## New Packaging for MBTS Saves 20% Space

New equipment for the production of MBTS, as reported in the July issue of Rubber Chem Lines, has now been in operation for over six months. The high expectations regarding the effect of plant modernization on product quality have been fully justified. Currently produced MBTS is remarkably uniform in particle size and free of even the small amount of oversized particles normally associated with a microground product. Dedusting and lubricating additives are well distributed. Ash is low and any magnetic iron particles are removed by electromagnet separation. The range of purity, or real MBTS content, is high and the amount of free MBT is low. The net result is a product which physically and chemically is designed and manufactured to the highest performance standards possible for a powdered accelerator.

Included in the new equipment is a vacuum bag packer capable of packing fifty pounds of fluffy, free-flowing MBTS into a considerably smaller bag than was formerly used. In effect, this machine "densifies" the freshly packed product to the same degree produced by normal stacking in storage. This densification in no way interferes with the free-flowing characteristics of the product, but merely eliminates the wasted bag capacity previously evident in shipped material.

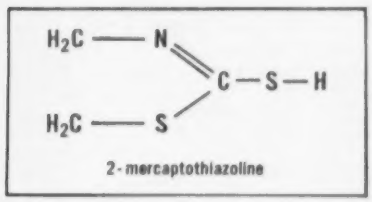
Illustrating the space-saving ability of this new package in warehouse storage, the schematic drawing shows unit loads of 2000 pounds each. The new bags are unitized in a pattern of five-bag layers, eight layers high. A corresponding unit load using the old bags required ten layers of four bags each. Since the base dimensions (which conform to a standard pallet size) remain unchanged, the effective reduction is in the height of the unit. The resultant cubic space reduction is approximately 20%. This should be of interest to any user of MBTS who has a warehouse storage space problem.




## 2-MT—A New Addition

(2-mercaptothiazoline)

To its wide range of accelerators for the rubber industry, Cyanamid has recently added 2-MT, a fast-curing accelerator active above 250° F. The chemical formula is:




2-mercaptothiazoline

As a special purpose accelerator, 2-MT should find applications where its particular properties are superior to the types currently available. For example, it is most effective in natural rubber channel black tread or carcass stocks. 2-MT offers good physical properties with high modulus, exceptional flex-cracking resistance and good heat aging characteristics.

In addition to its value in natural rubber stocks, 2-MT has proved very effective in high-grade cold GR-S camelback stocks. The excellent physical properties imparted to the camelback stock by the use of 2-MT result in greatly improved mileage.

Latex compounding offers another application for 2-MT. When used in combination with ultra accelerators, 2-MT has shown outstanding heat resistance. This property is naturally important for applications where the product is subjected to heat, such as the backing for rugs which are subsequently bleached, dyed and dried, and in latex threads which are used in garments ultimately exposed to laundering many times.

More information on this new accelerator is available to those interested, and samples will be sent on request. Your Cyanamid representative will be glad to help you in determining what areas of your rubber compounding problems 2-MT can best serve.

# PRICES OF COMMERCIALLY AVAILABLE SYNTHETIC RUBBER POLYMERS

*(dry types—per pound carload unless otherwise specified)*

### Butadiene-Acrylonitrile Types

| | |
|---|---|
| Butaprene NAA | .5400 [1] |
| Butaprene NF | .4900 [1] |
| Butaprene NL | .5000 [1] |
| Butaprene NXM | .5800 [1] |
| Chemigum N1 | .6400 [2] |
| Chemigum N3 | .5800 [2] |
| Chemigum N5 | .5800 [2] |
| Chemigum N6 | .5000 [2] |
| Chemigum N7 | .5000 [2] |
| Hycar 1001 | .5800 [2] |
| Hycar 1002 | .5000 [2] |
| Hycar 1014 | .6000 [2] |
| Hycar 1041 | .5800 [2] |
| Hycar 1042 | .5000 [2] |
| Hycar 1043 | .5000 [2] |
| Hycar 1312 | .5000 [2] |
| Hycar 1411 | .6200 [2] |
| Hycar 1432 | .5900 [2] |
| Hycar 1441 | .6200 [2] |
| Paracril AJ | .4850 [2] |
| Paracril B | .5000 [2] |
| Paracril BJ | .5000 [2] |
| Paracril BLT | .5000 [2] |
| Paracril C | .5800 [2] |
| Paracril CV | .5900 [2] |
| Paracril D | .6500 [2] |
| Paracril 18-80 | .6000 [2] |
| Polysar Krynac 800 | .5000 [2] |
| Polysar Krynac 801 | .5800 [2] |
| Polysar Krynac 802 | .5000 [2] |
| Polysar Krynac 803 | .5000 [2] |

### Butadiene-Styrene Types

| | |
|---|---|
| Ameripol 1001 | .2410 [2] |
| Ameripol 1002 | .2435 [2] |
| Ameripol 1006 | .2410 [2] |
| Ameripol 1500 | .2410 [2] |
| Ameripol 1501 | .2410 [2] |
| Ameripol 1502 | .2410 [2] |
| Ameripol 1703 | .2060 [2] |
| Ameripol 1705 | .2035 [2] |
| Ameripol 1706 | .2035 [2] |
| Ameripol 1707 | .1910 [2] |
| Ameripol 1709 | .1885 [2] |
| Ameripol 1710 | .1885 [2] |
| Ameripol 1711 | .1885 [2] |
| Ameripol 1712 | .1885 [2] |
| ASRC 1000 | .2410 [2] |
| ASRC 1001 | .2410 [2] |
| ASRC 1004 | .2410 [2] |
| ASRC 1006 | .2410 [2] |
| ASRC 1018 | .2700 [2] |
| ASRC 1019 | .2650 [2] |
| ASRC 1500 | .2410 [2] |
| ASRC 1502 | .2410 [2] |
| ASRC 1503 | .2625 [2] |
| ASRC 1703 | .2060 [2] |
| ASRC 1708 | .1910 [2] |
| Baytown 1600 | .1760 [2] |
| Baytown 1601 | .1760 [2] |
| Baytown 1602 | .1760 [2] |
| Baytown 1801 | .1600 [2] |
| Copo 1500 | .2410 [2] |
| Copo 1502 | .2410 [2] |
| Copo 1505 | .2610 [2] |
| Copo 1712 | .1885 [2] |
| FR-S 1000 | .2410 [2] |
| FR-S 1001 | .2410 [2] |
| FR-S 1004 | .2410 [2] |

### Butadiene-Styrene (Cont'd)

| | |
|---|---|
| FR-S 1006 | .2410 [2] |
| FR-S 1009 | .2475 [2] |
| FR-S 1010 | .2600 [2] |
| FR-S 1012 | .2425 [2] |
| FR-S 1013 | .2500 [2] |
| FR-S 1014 | .2810 [2] |
| FR-S 1015 | .2910 [2] |
| FR-S 1500 | .2410 [2] |
| FR-S 1502 | .2410 [2] |
| FR-S 1703 | .2060 [2] |
| FR-S 1705 | .2035 [2] |
| FR-S 1712 | .1885 [2] |
| Naugapol 1016 | .2650 [2] |
| Naugapol 1018 | .2700 [2] |
| Naugapol 1019 | .2650 [2] |
| Naugapol 1021 | .3000 [2] |
| Naugapol 1022 | .2800 [2] |
| Naugapol 1023 | .2850 [2] |
| Naugapol 1503 | .2625 [2] |
| Naugapol 1504 | .2950 [2] |
| Philprene 1000 | .2410 [1] |
| Philprene 1001 | .2410 [1] |
| Philprene 1006 | .2410 [1] |
| Philprene 1009 | .2550 [1] |
| Philprene 1018 | .2700 [1] |
| Philprene 1019 | .2650 [1] |
| Philprene 1500 | .2410 [1] |
| Philprene 1502 | .2410 [1] |
| Philprene 1503 | .2625 [1] |
| Philprene 1601 | .1910 [1] |
| Philprene 1605 | .1870 [1] |
| Philprene 1703 | .2060 [1] |
| Philprene 1706 | .2030 [1] |
| Philprene 1708 | .1910 [1] |
| Philprene 1712 | .1880 [1] |
| Philprene 1803 | .1720 [1] |
| Plioflex 1006 | .2410 [2] |
| Plioflex 1500 | .2410 [2] |
| Plioflex 1502 | .2410 [2] |
| Plioflex 1703 | .2060 [2] |
| Plioflex 1710 | .1885 [2] |
| Plioflex 1712 | .1885 [2] |
| Plioflex 1773 | .2060 [2] |
| Plioflex 1778 | .1910 [2] |
| Polysar Kryflex 200 | .2410 [2] |
| Polysar Krylene | .2410 [2] |
| Polysar Krylene NS | .2410 [2] |
| Polysar Krynol 651 | .1885 [2] |
| Polysar Krynol 652 | .1910 [2] |
| Polysar S | .2410 [2] |
| Polysar S-50 | .2410 [2] |
| Polysar S-X 371 | .2550 [2] |
| Polysar SS-250 | .3000 [2] |
| S-1000 | .2300 [1] |
| S-1001 | .2300 [2] |
| S-1002 | .2325 [1] |
| S-1006 | .2300 [2] |
| S-1011 | .2325 [2] |
| S-1013 | .2300 [2] |
| S-1100 | .1850 [2] |
| S-1500 | .2300 [2] |
| S-1502 | .2300 [2] |
| S-1600 | .1800 [2] |
| S-1601 | .1800 [2] |
| S-1602 | .1800 [2] |
| S-1703 | .1950 [2] |
| S-1706 | .1925 [2] |
| S-1707 | .1800 [2] |
| S-1709 | .1775 [2] |
| S-1712 | .1775 [2] |

### Butadiene-Styrene (Cont'd)

| | |
|---|---|
| S-1801 | .1650 [2] |
| S-2000 | .2275 [2] |
| S-2006 | .2150 [2] |
| S-2101 | .2250 [2] |
| Synpol 1000 | .2410 [1] |
| Synpol 1001 | .2410 [1] |
| Synpol 1002 | .2435 [1] |
| Synpol 1006 | .2410 [1] |
| Synpol 1007 | .2410 [1] |
| Synpol 1009 | .2475 [1] |
| Synpol 1012 | .2425 [1] |
| Synpol 1013 | .2500 [1] |
| Synpol 1061 | .2410 [1] |
| Synpol 1500 | .2410 [1] |
| Synpol 1502 | .2410 [1] |
| Synpol 1551 | .2410 [1] |
| Synpol 1703 | .2060 [1] |
| Synpol 1707 | .1910 [1] |
| Synpol 1708 | .1910 [1] |
| Synpol 1711 | .1900 [1] |

### Butyl Rubbers

| | |
|---|---|
| Enjay Butyl 035 | .2300 [2] |
| Enjay Butyl 150 | .2300 [2] |
| Enjay Butyl 165 NS | .2400 [2] |
| Enjay Butyl 215 | .2300 [2] |
| Enjay Butyl 217 | .2300 [2] |
| Enjay Butyl 218 | .2300 [2] |
| Enjay Butyl 268 NS | .2400 [2] |
| Enjay Butyl 325 | .2300 [2] |
| Enjay Butyl 365 NS | .2400 [2] |
| Polysar Butyl 100 | .2450 [2] |
| Polysar Butyl 101 | .2775 [2] |
| Polysar Butyl 200 | .2450 [2] |
| Polysar Butyl 300 | .2450 [2] |
| Polysar Butyl 301 | .2550 [2] |
| Polysar Butyl 400 | .2450 [2] |

### Neoprene

| | *(prices l.c.l.)* |
|---|---|
| Neoprene Types AC and CG | .5500 [3] |
| Neoprene Type GN | .4100 [3] |
| Neoprene Type GN-A | .4100 [3] |
| Neoprene Type GRT | .4200 [3] |
| Neoprene Type KNR | .7500 [3] |
| Neoprene Type S | .4200 [3] |
| Neoprene Type W | .3900 [3] |
| Neoprene Type WHV | .3900 [3] |
| Neoprene Type WRT | .4500 [3] |
| Neoprene Type WX | .4100 [3] |

### Silicone Rubbers*

| | *(prices l.c.l.)* |
|---|---|
| GE (compounded) | 2.50 [3] |
| GE Silicone Gum (not compounded) | 4.00 [3] |
| Silastic (compounded) | 1.90 [3] |
| Union Carbide (gums) | 4.00 [3] |
| Union Carbide (compounds) | 2.50 [3] |

### Polysulfide Rubbers

| | *(prices l.c.l.)* |
|---|---|
| Thiokol Type A | .4700 [3] |
| Thiokol Type FA | .6400 [3] |
| Thiokol PR-1 | .9500 [3] |
| Thiokol Type ST | 1.00 [3] |

*(latices—all prices per pound dry weight)*

### Butadiene-Acrylonitrile Types

| | |
|---|---|
| Butaprene N-300 | .4600 [1] |
| Butaprene N-400 | .5400 [1] |
| Butaprene N-401 | .5400 [1] |
| Chemigum 200 | .4900 [2] |
| Chemigum 235 | .5400 [2] |
| Chemigum 236 | .5400 [2] |
| Chemigum 245 | .4600 [2] |
| Chemigum 246 | .4600 [2] |
| Hycar 1512 | .4600 [2] |
| Hycar 1551 | .5400 [2] |
| Hycar 1552 | .4600 [2] |
| Hycar 1561 | .5400 [2] |
| Hycar 1562 | .4600 [2] |
| Hycar 1571 | .5400 [2] |
| Hycar 1572 | .5100 [2] |
| Hycar 1577 | .4600 [2] |
| Hycar 1852 | .4400 [2] |

### Butadiene-Styrene Types

| | |
|---|---|
| Copo 2101 | .3000 [2] |
| Copo 2102 | .3200 [2] |

### Butadiene-Styrene (Cont'd)

| | |
|---|---|
| Copo 2105 | .3200 [2] |
| Copo X-765 | .3000 [2] |
| FR-S 2000 | .2600 [2] |
| FR-S 2001 | .2600 [2] |
| FR-S 2002 | .2850 [2] |
| FR-S 2003 | .2950 [2] |
| FR-S 2004 | .2950 [2] |
| FR-S 2006 | .2600 [2] |
| FR-S 2105 | .3100 [2] |
| Pliolite 2101 | .3000 [2] |
| Pliolite 2104 | .3200 [2] |
| Pliolite 2105 | .3200 [2] |
| Pliolite X-765 | .3000 [2] |
| Naugatex 2000 | .2630 [2] |
| Naugatex 2001 | .2630 [2] |
| Naugatex 2002 | .2880 [2] |
| Naugatex 2006 | .2630 [2] |
| Naugatex 2105 | .3120 [2] |
| Naugatex X-765 | .2900 [2] |

### Butadiene-Styrene (Cont'd)

| | |
|---|---|
| Naugatex X-767 | .3120 [2] |
| S-2004 | .2600 [2] |
| S-2105 | .3100 [2] |

### Neoprene

| | |
|---|---|
| Neoprene Latex 60 | .4000 [3] |
| Neoprene Latex 571 | .3700 [3] |
| Neoprene Latex 572 | .3900 [3] |
| Neoprene Latex 601-A | .4000 [3] |
| Neoprene Latex 735 | .3800 [3] |
| Neoprene Latex 736 | .3800 [3] |
| Neoprene Latex 842-A | .3700 [3] |
| Neoprene Latex 950 | .4700 [3] |

### Polysulfide Rubbers

| | |
|---|---|
| Thiokol Type MX | .7000 [3] |
| Thiokol Type WD-2 | .9200 [3] |
| Thiokol Type WD-6 | .7000 [3] |

Notes: (1) Freight allowed. (2) Freight extra. (3) Freight prepaid. * Covers a wide range of compounds. Readers are urged to check specific prices with producers.

# MARKETS

(continued)

## Reclaimed Rubber

When complete 1956 figures are available they will show that approximately 280,000 long tons of reclaimed rubber were consumed in the United States, a figure some 40,000 long tons less than was estimated at the beginning of the year. The 280,000 ton figure is about 19% of the 1,435,000 long tons of new rubber estimated to have been consumed in 1956.

In 1955, reclaimed rubber's percentage to new rubber consumption was 20.4%, while back in 1951, the percentage was 28.6%. It would appear that with the passing years, reclaim's percentage to new rubber consumption has been going down. Since total new rubber consumption has been going up, however, the relative tonnages involved, at least for the past 4 or 5 years, have remained fairly stable. With this as a background, a safe estimate for reclaim consumption in 1957 would be in the order of 285,000 long tons, as a minimum.

*(Prices for All Areas Except Calif.)*

| | per lb. |
|---|---|
| Premium Grade Whole Tire | .11 |
| First Line Whole Tire | .10½ |
| Second Line Whole Tire | .10 |
| Third Line Whole Tire | .09¼ |
| Fourth Line Whole Tire | .09¼ |
| Black Carcass | .14¾ |
| No. 1 Light Colored Carcass | .20¾ |
| No. 1 Peel | .11 |
| Butyl Tube Reclaim | .14 |
| Natural Rubber Black Tube | .15 |
| Natural Rubber Red Tube | .21 |
| Natural Rubber Gray Tube | .21 |

## Scrap Rubber

There were no new developments in the scrap rubber market at the turn of the year. Suppliers were generally working on filling mixed automobile tire orders for January shipment. Only routine business was reported for tubes and scrap rubber prices were stable.

The scrap rubber market, by many counts, was not too pleased with 1956, with one spokesman classifying it as a year of "diminishing returns". Despite increased freight and labor costs, prices receded to unprofitable lows. It is said that in many cases that the cost of handling and shipping scrap tires is more than the shippers realize from their sale.

There are some indications that scrap rubber prices will move slightly higher in the early months of 1957 because of increased demand. The consensus would seem to be, however, that prospects are not overly bright.

*(Prices Delivered Akron)*

| | | |
|---|---|---|
| Mixed tires | ton | 16.00 |
| Light colored carcass | lb. | .05½ |
| No. 1 peelings | ton | 45.00 |
| No. 2 peelings | ton | 30.00 |
| No. 3 peelings | ton | 21.00 |
| Buffings | ton | 16.00 |
| Truck and Bus S.A.G. | ton | 19.00 |
| Passenger S.A.G. | ton | 17.50 |
| Natural Rubber Red Tubes | lb. | .07¾ |
| Natural Rubber Black Tubes | lb. | .07 |
| Butyl Rubber Tubes | lb. | .04¼ |

## Tire Fabrics

The Japan Chemical Fibre Association reports that the Ministry of Trade will permit imports of high tenacity rayon for automobile tire production from the United States to relieve an acute shortage resulting from active requirements for passenger car tires from both domestic and overseas consumers.

The Association said the Ministry intends to approve the imports of about 1,070,000 pounds of the yarn as an emergency measure. The decision followed the Japanese tire industry's approach to the ministry for the importation of 1,200,000 pounds.

The Japanese tire manufacturers said the continuous rise in the domestic and internal demands for automobile tires since last May had proved a stimulant to their production. Tire production has been raised so fast that the rayon producers have been unable to keep pace with it.

Although the rayon mills continued to exert efforts to enlarge their output gradually, they were not so optimistic as to expand capacity sharply to meet the increased needs for the yarn, because they feared a possible decline in demand in the future, the Association said.

The tire manufacturers estimate that in the first three months of this year the Japanese tire industry will need about 6,860,000 pounds of rayon for tire cord, of which 5,600,000 pounds will be covered by domestic supply, leaving a shortage of 1,260,000 pounds. The remainer has to be covered by emergency imports.

### Rayon Tire Yarn Prices Rising

In the U. S., meanwhile, prices of rayon tire yarn have begun to turn upward after dropping for almost a year. At this writing, American Enka has already announced a three cents a pound increase on two types of its rayon tire yarns. There have been no indications from other firms, however, as to price increases at this time.

Many in the trade are of the opinion that most tire yarn makers would like to increase their prices, since price cutting and reduced demand caused by lower automobile production slashed deeply into profits in 1956. Much of the 1956 price cutting was undertaken to combat the inroads of nylon yarn on the market. Since prices of nylon tire yarns have not gone up, there is some question of how general the boost in rayon tire yarn prices will be, and thus an element of caution has been introduced.

*(Prices f.o.b. Shipping Point)*

### Rayon Tire Cord

| | | |
|---|---|---|
| 1100 | lb. | .73 |
| 1650 | lb. | .67 |
| 2200 | lb. | .67½ |

### Nylon Tire Cord

| | | |
|---|---|---|
| 210 | lb. | 1.95 |
| 840 | lb. | 1.80 |

### Rayon Graded Fabric

| | | |
|---|---|---|
| 100 | lb. | .69 |
| 1650 | lb. | .63½ |
| 2200 | lb. | .63 |

### Cotton Chafers

| | | |
|---|---|---|
| 14.4 oz. (per square yard) | lb. | .73 |
| 9.25 oz. (per square yard) | lb. | .68 |
| 11.65 oz. (per square yard) | lb. | .64 |
| 8.9 oz. (per square yard) | lb. | .70 |

## Liquid Latex

**Natural:** The trade reports that during 1956 hevea latex sold at "distressed" prices, a situation caused by purchases being scaled to 1955 consumption patterns. The industry generally feels that price levels of from 40 to 45c will not permit the fullest utilization of natural rubber latex as the alternatives are lower priced. At this writing, hevea latex is selling at about 43c per pound in ton car lots at East Coast ports.

Future trends in hevea latex are difficult to estimate because of the present price levels and because consumers have not as yet made clear what their requirements are likely to be in the first half of 1957. It should be noted that consumption at the end of 1956 was approaching the record levels set in 1955. It is estimated that something like 72,000 to 75,000 tons of hevea latex were consumed in the U.S. in 1956.

**Synthetic:** Approximately 64,000 long tons of GR-S type latex were consumed in the U.S. in 1956, a few thousand tons less than were consumed in 1955. Prices were practically unchanged during the year and the trade does not expect any major changes in 1957. Production facilities for high solids types are now being expanded, present capacity not being equal to demand.

N-type and neoprene latices were consumed in 1956 at about the same rate as in 1955, between 8,000 and 9,000 tons each. Production seems adequate to cope with foreseeable demands and prices are stable.

If late 1956 consumption rates carry on through 1957, this year's consumption may rival 1955's. As a whole, the trade believes the consumption curve to be rising and this one fact alone is an encouraging note for the months ahead.

## Cotton

The price of middling uplands has moved in the rather small range of 35 points since our last report (November 30), high for the period being 34.75c reached on December 12, and low being 34.40c reached on December 4. The average price of middling uplands for the month of December was 34.56c based on 19 trading days. This compares with an average of 34.56c in November.

The Commodity Credit Corporation has taken over more than 6,000,000 bales of 1955 crop cotton and the possibility exists that the agency will have the cotton listed for export by the end of February. The agency reports that loans on 1956 crop cotton totaled 3,796,217 bales, and the net stock was 3,558,345 bales. The net 1955 stock which was taken over was 6,038,488 bales.

Cotton prices will probably be influenced by what Congress does with farm legislation. It is known that some changes are desired by the Department of Agriculture, which wants to sell cotton to Soviet controlled countries, or at least to those countries which show evidence of slipping from Soviet control. Current thinking is that the loan on cotton for next year will be the same or slightly higher.

The Agriculture Department has estimated exports for 1956-57 at 6,500,000 bales and consumption of about 9,000,000 bales. It is not expected that the government will add to its stockpile during this year.

# STATISTICS of the industry

PERTINENT INDUSTRY DATA

## Natural Rubber in the United States

### (Including Latex and Guayule)

*(All Quantities in Long Tons)*

| Year | New Supply | Consumption | Re-Exports | Stocks On Hand at End of Period |
|---|---|---|---|---|
| 1931 | 501,788 | 355,200 | 25,609 | 322,000 |
| 1932 | 414,668 | 336,700 | 20,937 | 379,000 |
| 1933 | 418,902 | 412,400 | 20,576 | 365,000 |
| 1934 | 463,018 | 462,500 | 23,856 | 355,000 |
| 1935 | 467,146 | 495,500 | 11,391 | 303,000 |
| 1936 | 488,145 | 575,000 | 12,582 | 223,000 |
| 1937 | 600,479 | 543,600 | 7,902 | 262,204 |
| 1938 | 411,983 | 437,031 | 5,652 | 231,500 |
| 1939 | 499,473 | 592,000 | 13,125 | 125,800 |
| 1940 | 818,243 | 648,500 | 7,060 | 288,864 |
| 1941 | 1,029,007 | 775,000 | 5,376 | 533,344 |
| 1942 | 282,653 | 376,791 | 10,856 | 422,714 |
| 1943 | 55,329 | 317,634 | 20,815 | 139,594 |
| 1944 | 107,834 | 144,113 | 9,665 | 93,650 |
| 1945 | 135,672 | 105,429 | 6,743 | 118,715 |
| 1946 | 400,687 | 277,597 | 4,338 | 237,467 |
| 1947 | 688,354 | 562,661 | 4,101 | 129,038 |
| 1948 | 735,227 | 627,332 | 6,673 | 141,541 |
| 1949 | 660,792 | 574,522 | 6,253 | 106,619 |
| 1950 | 802,249 | 720,268 | 8,644 | 89,215 |
| 1951 | 733,048 | 454,015 | 2,603 | 76,569 |
| 1952 | 805,997 | 453,846 | 3,024 | 95,260 |
| 1953 | 647,150 | 553,473 | 8,376 | 112,316 |
| 1954 | 596,848 | 596,285 | 7,443 | 104,543 |
| 1955 | 635,174 | 634,800 | 10,611 | 110,105 |
| 1955: | | | | |
| Sept. | 50,459 | 50,963 | 980 | 113,185 |
| Oct. | 45,720 | 54,995 | 869 | 110,795 |
| Nov. | 50,509 | 52,769 | 1,102 | 103,764 |
| Dec. | 50,556 | 48,565 | 986 | 109,854 |
| 1956: | | | | |
| Jan. | 58,803 | 53,551 | 1,827 | 111,943 |
| Feb. | 53,353 | 50,285 | 752 | 111,832 |
| Mar. | 52,749 | 50,040 | 505 | 108,974 |
| Apr. | 51,394 | 47,446 | 731 | 109,822 |
| May | 39,789 | 48,342 | 753 | 107,324 |
| June | 36,694 | 42,845 | 865 | 101,748 |
| July | 41,195 | 38,353 | 712 | 103,301 |
| Aug. | 40,367 | 46,091 | 759 | 97,967 |
| Sept. | 42,974 | 44,179 | 1,184 | 98,069 |
| Oct. | ..... | 51,259 | ..... | 92,300 |

Source: U. S. Department of Commerce.

## U. S. Imports of Natural Rubber

| Year | Dry | | Latex | | Total Imports |
|---|---|---|---|---|---|
| | Long Tons | Declared Value | Long Tons | Declared Value | |
| 1935 | 453,134 | 115,299,448 | 13,553 | 3,782,222 | 466,687 |
| 1936 | 467,064 | 152,072,496 | 19,852 | 6,659,899 | 486,916 |
| 1937 | 574,600 | 237,307,041 | 23,185 | 10,213,670 | 597,785 |
| 1938 | 397,640 | 125,373,864 | 11,944 | 4,168,127 | 409,584 |
| 1939 | 469,946 | 167,586,780 | 27,437 | 10,467,552 | 497,383 |
| 1940 | 781,202 | 303,308,823 | 33,789 | 14,593,466 | 814,991 |
| 1941 | 989,498 | 401,976,317 | 34,797 | 15,965,627 | 1,024,245 |
| 1942 | 266,276 | 112,537,426 | 10,646 | 5,630,667 | 276,922 |
| 1943 | 50,358 | 31,369,198 | 1,890 | 1,312,202 | 52,248 |
| 1944 | 103,847 | 73,908,549 | 3,091 | 2,092,211 | 106,938 |
| 1945 | 134,408 | 95,814,102 | 4,773 | 3,115,853 | 139,181 |
| 1946 | 376,502 | 228,796,110 | 8,421 | 5,843,085 | 384,923 |
| 1947 | 691,087 | 306,951,814 | 17,542 | 9,787,722 | 708,629 |
| 1948 | 702,293 | 290,849,177 | 32,745 | 18,288,223 | 735,038 |
| 1949 | 630,808 | 225,343,624 | 29,743 | 14,968,650 | 660,551 |
| 1950 | 747,109 | 416,222,598 | 54,401 | 41,764,486 | 801,510 |
| 1951 | 677,874 | 727,343,348 | 54,963 | 80,178,309 | 732,837 |
| 1952 | 756,987 | 578,179,519 | 48,228 | 40,563,116 | 805,215 |
| 1953 | 571,635 | 284,909,223 | 75,511 | 46,353,333 | 647,146 |
| 1954 | 522,364 | 219,098,143 | 74,483 | 42,755,029 | 596,847 |
| 1955 | 542,507 | 360,435,303 | 92,825 | 80,163,114 | 635,332 |
| 1955: | | | | | |
| Sept. | 42,350 | 29,854,781 | 8,108 | 7,902,094 | 50,458 |
| Oct. | 38,820 | 30,746,494 | 6,900 | 7,539,732 | 45,720 |
| Nov. | 43,423 | 34,989,275 | 7,085 | 8,063,930 | 50,508 |
| Dec. | 41,759 | 34,512,483 | 6,436 | 6,853,858 | 48,195 |
| 1956: | | | | | |
| Jan. | 48,476 | 38,397,341 | 10,328 | 10,355,488 | 58,804 |
| Feb. | 45,682 | 35,983,385 | 7,670 | 7,814,076 | 46,449 |
| Mar. | 44,947 | 35,238,125 | 7,791 | 7,507,686 | 52,738 |
| Apr. | 44,443 | 31,826,631 | 6,996 | 6,369,348 | 51,439 |
| May | 34,058 | 22,579,829 | 5,731 | 4,782,907 | 39,789 |
| June | 31,687 | 19,375,943 | 5,006 | 3,732,281 | 36,693 |
| July | 37,673 | 22,164,793 | 3,522 | 2,539,365 | 41,195 |
| Aug. | 35,652 | 19,703,676 | 4,715 | 3,277,700 | 40,367 |
| Sept. | 40,184 | 23,453,972 | 2,790 | 2,207,011 | 42,974 |

Source: Bureau of the Census, U. S. Department of Commerce.

## World Production of Natural Rubber

### (Including Latex)

*(Long Tons)*

| Year | Malaya | Indonesia | Ceylon | Viet Nam & Cambodia | Latin America | Rest of World* | Total* |
|---|---|---|---|---|---|---|---|
| 1945 | 8,600* | 10,000* | 97,500 | 12,000* | 47,125 | 73,570 | 250,000 |
| 1946 | 403,719 | 175,000* | 94,000 | 19,975 | 39,678* | 105,080 | 837,500 |
| 1947 | 646,362 | 277,951 | 89,000 | 38,128 | 34,928* | 172,782 | 1,260,000 |
| 1948 | 698,189 | 432,349 | 95,000 | 43,935 | 29,158* | 225,557 | 1,525,000 |
| 1949 | 671,503 | 432,996 | 89,500 | 43,010 | 27,318* | 225,659 | 1,490,000 |
| 1950 | 694,090 | 696,472 | 113,500 | 48,482 | 26,902* | 280,299 | 1,860,000 |
| 1951 | 605,346 | 814,406 | 105,000 | 52,136 | 29,777* | 278,262 | 1,885,000 |
| 1952 | 584,238 | 750,494 | 96,500 | 63,134 | 35,475* | 261,211 | 1,790,000 |
| 1953 | 574,390 | 692,164 | 98,610 | 74,545 | 35,318* | 250,182 | 1,725,000 |
| 1954 | 584,435 | 738,670 | 93,935 | 78,024 | 26,833* | 280,112 | 1,802,500 |
| 1955 | 639,128 | 733,786 | 93,830 | 80,172 | 6,000* | 344,584 | 1,897,500 |
| 1956: | | | | | | | |
| Jan. | 59,085 | 41,441 | 9,015 | 9,829 | 2,941* | 27,689 | 150,000 |
| Feb. | 51,497 | 44,427 | 4,578 | 2,217 | 2,536* | 29,745 | 135,000 |
| Mar. | 51,023 | 38,413 | 5,179 | 3,054 | 2,921* | 29,410 | 130,000 |
| Apr. | 48,394 | 66,164 | 6,678 | 5,117 | 3,447* | 25,200 | 155,000 |
| May | 43,224 | 56,369 | 7,156 | 7,222 | 500* | 23,029 | 137,500 |
| June | 52,653 | 47,831 | 6,527 | 7,139 | 1,527 | 29,313 | 145,000 |
| July | 54,685 | 62,715 | 10,503 | 8,146 | 500* | 25,951 | 162,000 |
| Aug. | 53,277 | 84,294 | 9,101 | ..... | 500* | 32,828 | 180,000 |

Source: International Rubber Study Group. * Estimated.

## World Consumption of Natural and Synthetic Rubber

### (Including Latex)

*(Long Tons)*

| Year | United States | United Kingdom | Canada | Europe* | Rest of World* | Total* |
|---|---|---|---|---|---|---|
| 1944 | 710,783 | 86,977 | 34,310 | 132,500 | 160,690 | 1,125,000 |
| 1945 | 799,009 | 91,047 | 41,836 | 87,500 | 108,164 | 1,127,500 |
| 1946 | 1,039,296 | 126,770 | 39,196 | 145,000 | 115,804 | 1,467,500 |
| 1947 | 1,122,327 | 156,399 | 61,452 | 242,500 | 153,548 | 1,735,000 |
| 1948 | 1,069,404 | 196,286 | 62,121 | 392,000 | 182,379 | 1,902,500 |
| 1949 | 988,903 | 186,622 | 56,362 | 446,500 | 207,388 | 1,887,500 |
| 1950 | 1,258,557 | 222,425 | 68,695 | 448,500 | 287,055 | 2,285,000 |
| 1951 | 1,214,298 | 238,101 | 70,809 | 476,500 | 314,941 | 2,312,500 |
| 1952 | 1,261,413 | 202,179 | 67,099 | 550,000 | 254,901 | 2,335,000 |
| 1953 | 1,338,309 | 211,453 | 73,394 | 521,000 | 343,606 | 2,500,000 |
| 1954 | 1,233,012 | 247,612 | 71,656 | 544,250 | 408,094 | 2,505,000 |
| 1955 | 1,529,699 | 266,804 | 84,528 | 614,250 | 480,000 | 2,980,000 |
| 1956: | | | | | | |
| Jan. | 132,231 | 24,819 | 7,330 | 58,750 | 39,370 | 262,500 |
| Feb. | 125,525 | 20,993 | 7,480 | 64,250 | 36,752 | 255,000 |
| Mar. | 127,928 | 19,127 | 7,367 | 68,250 | 32,328 | 255,000 |
| Apr. | 122,128 | 21,991 | 7,963 | 59,500 | 40,918 | 252,500 |
| May | 124,738 | 17,670 | 8,157 | 69,750 | 34,685 | 255,000 |
| June | 111,454 | 19,698 | 7,658 | 77,250 | 33,940 | 250,000 |
| July | 96,549 | 17,565 | 6,831 | 62,250 | 39,305 | 222,500 |
| Aug. | 117,556 | 15,558 | 6,375 | ..... | 91,011 | 227,500 |

Source: International Rubber Study Group. * Estimated.

## Rim Production

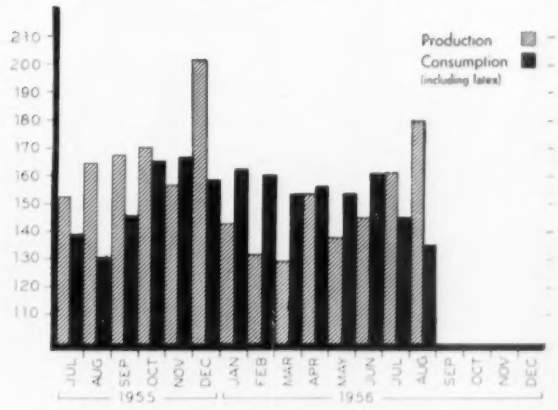
| | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|
| Passenger Car | 24,936,844 | 31,318,461 | 25,952,322 | 38,092,080 | 27,109,610 |
| Truck & Bus | 5,752,674 | 5,228,321 | 4,463,689 | 6,642,329 | 6,315,428 |
| Agricultural | 2,073,116 | 1,943,487 | 1,297,040 | 1,931,768 | 1,416,938 |
| Earth Mover | 31,791 | 24,685 | 21,536 | 38,859 | 88,812 |
| Total | 32,794,425 | 38,514,954 | 31,734,587 | 46,705,036 | 34,930,788 |

| | 1956 | | | | | |
|---|---|---|---|---|---|---|
| | July | Aug. | Sept. | Oct. | Nov. | Dec. |
| Passenger Car | 1,795,980 | 1,662,478 | 1,503,720 | 2,249,790 | 2,744,187 | 2,633,768 |
| Truck & Bus | 447,592 | 444,204 | 549,760 | 563,660 | 386,557 | 408,167 |
| Agricultural | 83,413 | 79,190 | 80,379 | 93,601 | 118,435 | 64,640 |
| Earth Mover | 9,200 | 4,338 | 12,740 | 7,949 | 8,363 | 8,252 |
| Total | 2,336,185 | 2,190,210 | 2,146,599 | 2,915,000 | 3,257,542 | 3,114,827 |

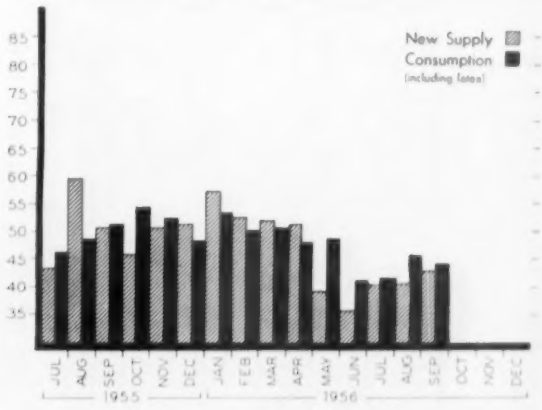
Source: The Tire & Rim Association, Inc.

# STATISTICS at a glance

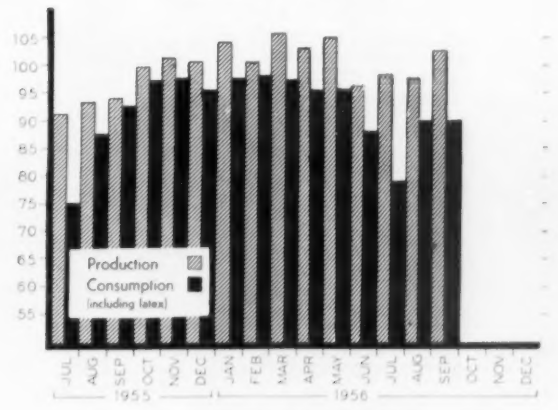
NATURAL RUBBER—WORLD
(thousands of long tons)



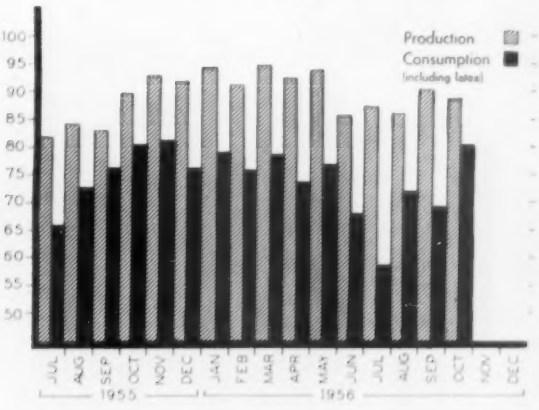

NATURAL RUBBER—UNITED STATES
(thousands of long tons)



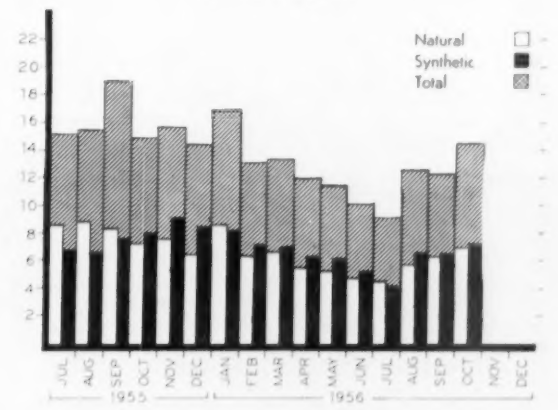

SYNTHETIC RUBBER—WORLD
(thousands of long tons)



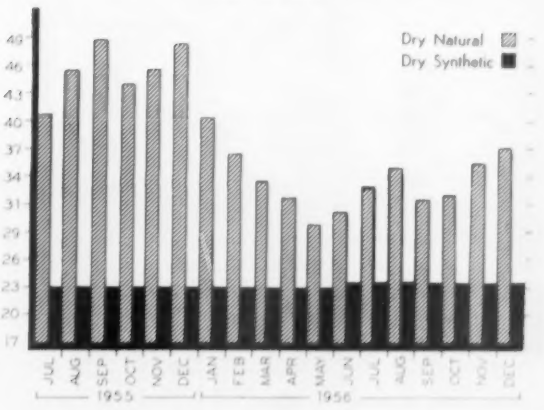

SYNTHETIC RUBBER—UNITED STATES
(thousands of long tons)




LATEX CONSUMPTION—UNITED STATES
(thousands of long tons)




PRICES—NATURAL AND SYNTHETIC
(cents per pound)



# Synthetic Rubber in the United States

*(All Quantities in Long Tons)*

## New Supply

| Year | GR-S | Neoprene | Butyl | N-Type | Total |
|---|---|---|---|---|---|
| 1949 | 310,529 | 35,215 | 54,046 | 11,072 | 410,932 |
| 1950 | 378,887 | 50,067 | 60,915 | 12,037 | 501,906 |
| 1951 | 704,529 | 58,907 | 76,475 | 15,333 | 855,244 |
| 1952 | 654,854 | 65,745 | 81,630 | 16,228 | 818,447 |
| 1953 | 680,728 | 80,495 | 79,801 | 20,198 | 861,222 |
| 1954 | 490,405 | 69,150 | 58,802 | 21,396 | 639,753 |
| 1955 | 801,145 | 91,357 | 56,179 | 32,623 | 982,304 |
| 1955: | | | | | |
| Dec. | 74,794 | 8,455 | 4,710 | 3,068 | 91,027 |
| 1956: | | | | | |
| Jan. | 76,028 | 8,207 | 6,896 | 3,125 | 94,256 |
| Feb. | 73,457 | 8,560 | 6,229 | 2,989 | 91,235 |
| Mar. | 77,812 | 7,822 | 5,686 | 3,663 | 94,983 |
| Apr. | 74,502 | 8,481 | 5,685 | 3,648 | 92,316 |
| May | 78,309 | 7,795 | 5,647 | 2,903 | 94,654 |
| June | 69,820 | 8,929 | 4,638 | 2,350 | 85,737 |
| July | 70,831 | 7,935 | 7,192 | 2,460 | 88,418 |
| Aug. | 70,122 | 7,769 | 7,118 | 2,125 | 87,134 |
| Sept. | 73,321 | 8,328 | 7,252 | 2,322 | 91,223 |
| Oct. | 70,203 | 8,144 | 6,880 | 2,931 | 88,158 |

## Consumption

| | | | | | |
|---|---|---|---|---|---|
| 1949 | 321,137 | 31,753 | 52,664 | 8,827 | 414,381 |
| 1950 | 416,230 | 43,781 | 66,348 | 11,930 | 538,289 |
| 1951 | 626,444 | 48,887 | 70,500 | 13,066 | 758,897 |
| 1952 | 666,420 | 55,522 | 71,229 | 13,866 | 807,037 |
| 1953 | 624,181 | 65,900 | 77,826 | 16,929 | 784,836 |
| 1954 | 500,345 | 57,203 | 61,464 | 17,715 | 636,727 |
| 1955 | 741,997 | 72,876 | 53,991 | 26,035 | 894,899 |
| 1955: | | | | | |
| Dec. | 63,137 | 6,496 | 4,197 | 2,113 | 75,943 |
| 1956: | | | | | |
| Jan. | 65,375 | 6,684 | 4,223 | 2,198 | 78,480 |
| Feb. | 62,366 | 6,430 | 4,155 | 2,289 | 75,240 |
| Mar. | 64,458 | 6,542 | 4,515 | 2,373 | 77,888 |
| Apr. | 62,179 | 6,125 | 4,228 | 2,150 | 74,682 |
| May | 63,629 | 6,379 | 4,285 | 2,103 | 76,396 |
| June | 56,390 | 5,536 | 4,026 | 1,864 | 67,816 |
| July | 48,907 | 4,435 | 3,316 | 1,538 | 58,196 |
| Aug. | 59,756 | 6,554 | 4,102 | 2,125 | 72,537 |
| Sept. | 57,135 | 6,057 | 4,044 | 1,969 | 69,205 |
| Oct. | 66,453 | 7,062 | 4,626 | 2,401 | 80,542 |

## Exports

| | | | | | |
|---|---|---|---|---|---|
| 1949 | 1,401 | 3,330 | 178 | 1,574 | 6,483 |
| 1950 | 900 | 4,826 | 31 | 1,895 | 7,652 |
| 1951 | 483 | 6,825 | 216 | 1,725 | 9,249 |
| 1952 | 9,467 | 9,813 | 126 | 2,695 | 22,101 |
| 1953 | 7,692 | 11,494 | 237 | 3,245 | 22,668 |
| 1954 | 11,069 | 12,062 | 2,831 | 4,155 | 30,117 |
| 1955 | 60,704 | 18,098 | 9,895 | 4,593 | 93,290 |
| 1955: | | | | | |
| Dec. | 7,837 | 1,786 | 968 | 375 | 10,966 |
| 1956: | | | | | |
| Jan. | 7,550 | 1,757 | 815 | 506 | 10,628 |
| Feb. | 9,018 | 1,521 | 1,624 | 449 | 12,612 |
| Mar. | 10,804 | 1,500 | 764 | 522 | 13,590 |
| Apr. | 10,271 | 1,917 | 374 | 587 | 13,149 |
| May | 10,864 | 2,142 | 743 | 443 | 14,192 |
| June | 9,310 | 2,088 | 746 | 548 | 12,692 |
| July | 9,038 | 1,994 | 523 | 433 | 11,988 |
| Aug. | 9,607 | 2,268 | 654 | 274 | 12,803 |
| Sept. | 8,804 | 2,824 | 439 | 403 | 12,470 |

## Stocks

| | | | | | |
|---|---|---|---|---|---|
| 1949 | 77,731 | 4,654 | 12,224 | 3,433 | 98,042 |
| 1950 | 36,942 | 5,733 | 7,243 | 2,840 | 52,758 |
| 1951 | 105,271 | 8,379 | 12,481 | 3,821 | 129,912 |
| 1952 | 83,861 | 8,535 | 22,716 | 3,875 | 118,987 |
| 1953 | 135,153 | 11,480 | 24,866 | 4,346 | 175,845 |
| 1954 | 115,499 | 11,349 | 19,267 | 4,280 | 150,395 |
| 1955 | 108,989 | 12,220 | 10,500 | 6,030 | 137,739 |
| 1955: | | | | | |
| Dec. | 108,136 | 11,971 | 10,223 | 5,300 | 135,630 |
| 1956: | | | | | |
| Jan. | 111,263 | 11,850 | 12,303 | 6,316 | 141,732 |
| Feb. | 114,389 | 11,888 | 13,027 | 6,602 | 145,906 |
| Mar. | 118,063 | 12,037 | 13,458 | 7,437 | 150,995 |
| Apr. | 121,054 | 12,042 | 14,071 | 8,243 | 155,410 |
| May | 127,163 | 11,478 | 15,253 | 8,788 | 162,682 |
| June | 133,570 | 12,927 | 15,744 | 2,086 | 164,327 |
| July | 145,601 | 15,084 | 18,899 | 2,009 | 181,593 |
| Aug. | 148,176 | 14,540 | 21,267 | 8,503 | 192,486 |
| Sept. | 154,841 | 14,055 | 23,862 | 8,035 | 200,793 |
| Oct. | 150,436 | 12,535 | 25,182 | 7,482 | 195,635 |

Source: U. S. Department of Commerce.

# Natural and Synthetic Rubber Latex in the United States

*(All Quantities in Long Tons)*

## New Supply

| Year | Natural | GR-S | Neoprene | N-Type | Total Synthetic | Grand Total |
|---|---|---|---|---|---|---|
| 1944 | 3,090 | 6,580 | 4,683 | ..... | 11,263 | 14,353 |
| 1945 | 4,768 | 13,176 | 7,077 | ..... | 22,253 | 27,021 |
| 1946 | 8,012 | 24,810 | 13,595 | ..... | 38,405 | 46,417 |
| 1947 | 17,675 | 22,474 | 6,089 | ..... | 28,563 | 46,238 |
| 1948 | 32,630 | 21,494 | 5,022 | ..... | 26,516 | 59,146 |
| 1949 | 29,974 | 21,357 | 3,651 | ..... | 25,008 | 54,982 |
| 1950 | 54,401 | 31,339 | 5,725 | ..... | 37,064 | 91,465 |
| 1951 | 54,963 | 32,972 | 6,866 | 2,948 | 42,786 | 97,749 |
| 1952 | 48,228 | 42,273 | 7,598 | 4,164 | 54,035 | 102,263 |
| 1953 | 75,511 | 48,112 | 9,026 | 5,844 | 62,982 | 138,493 |
| 1954 | 74,483 | 48,379 | 8,214 | 6,866 | 63,459 | 137,942 |
| 1955 | 92,754 | 69,364 | 10,432 | 10,798 | 90,594 | 183,348 |
| 1955: | | | | | | |
| Sept. | 8,109 | 5,698 | 994 | 1,086 | 7,778 | 18,887 |
| Oct. | 6,900 | 6,231 | 922 | 883 | 8,036 | 14,936 |
| Nov. | 7,085 | 6,933 | 1,004 | 781 | 8,718 | 15,803 |
| Dec. | 6,018 | 6,407 | 962 | 874 | 8,243 | 14,261 |
| 1956: | | | | | | |
| Jan. | 10,328 | 6,885 | 848 | 919 | 8,652 | 18,890 |
| Feb. | 7,965 | 6,943 | 930 | 827 | 8,700 | 16,665 |
| Mar. | 7,800 | 5,911 | 782 | 1,158 | 7,851 | 15,651 |
| Apr. | 6,995 | 6,066 | 969 | 866 | 7,901 | 14,896 |
| May | 5,731 | 4,966 | 939 | 614 | 6,519 | 12,250 |
| June | 5,006 | 4,776 | 907 | 543 | 6,226 | 11,232 |
| July | 3,522 | 4,241 | 444 | 731 | 5,416 | 8,938 |
| Aug. | 4,715 | 4,902 | 882 | 684 | 6,468 | 11,183 |
| Sept. | 2,790 | 5,723 | 1,180 | 938 | 7,841 | 10,631 |
| Oct. | ..... | 6,122 | 908 | 1,183 | 8,213 | 8,213 |

## Consumption[1]

| | | | | | | |
|---|---|---|---|---|---|---|
| 1944 | 6,085 | 6,000 | 4,400 | .... | 10,400 | 16,485 |
| 1945 | 3,886 | 14,500 | 6,800 | .... | 21,300 | 25,186 |
| 1946 | 5,714 | 23,500 | 13,000 | .... | 36,500 | 42,214 |
| 1947 | 13,909 | 22,500 | 6,500 | .... | 29,000 | 42,909 |
| 1948 | 28,489 | 21,500 | 5,250 | .... | 26,750 | 55,239 |
| 1949 | 36,117 | 21,500 | 3,750 | .... | 25,250 | 61,367 |
| 1950 | 56,138 | 31,000 | 5,500 | .... | 36,500 | 92,638 |
| 1951 | 46,750 | 31,031 | 6,279 | 2,628 | 39,938 | 86,688 |
| 1952 | 53,567 | 40,562 | 7,368 | 3,093 | 51,023 | 104,590 |
| 1953 | 67,375 | 46,473 | 7,981 | 3,654 | 58,108 | 125,483 |
| 1954 | 75,931 | 44,173 | 7,251 | 4,507 | 55,931 | 131,862 |
| 1955 | 86,478 | 63,982 | 8,736 | 8,495 | 81,213 | 167,691 |
| 1955: | | | | | | |
| Sept. | 7,452 | 5,505 | 730 | 878 | 7,113 | 14,565 |
| Oct. | 7,209 | 5,704 | 739 | 614 | 7,057 | 14,266 |
| Nov. | 6,620 | 5,954 | 829 | 603 | 7,386 | 14,006 |
| Dec. | 6,473 | 5,719 | 768 | 538 | 7,025 | 13,498 |
| 1956: | | | | | | |
| Jan. | 6,776 | 5,858 | 772 | 670 | 7,300 | 14,076 |
| Feb. | 6,399 | 5,913 | 787 | 730 | 7,430 | 13,829 |
| Mar. | 6,438 | 5,888 | 729 | 781 | 7,398 | 13,836 |
| Apr. | 5,693 | 4,923 | 741 | 692 | 6,356 | 12,049 |
| May | 5,239 | 4,745 | 778 | 691 | 6,214 | 11,453 |
| June | 5,171 | 4,350 | 637 | 657 | 5,644 | 10,815 |
| July | 4,855 | 3,731 | 562 | 466 | 4,759 | 9,614 |
| Aug. | 6,374 | 5,055 | 816 | 698 | 6,569 | 12,943 |
| Sept. | 6,233 | 4,937 | 692 | 699 | 6,328 | 12,561 |
| Oct. | 7,297 | 5,884 | 773 | 480 | 7,137 | 14,434 |

## Stocks at End of Period

| | | | | | | |
|---|---|---|---|---|---|---|
| 1944 | 2,443 | .... | .... | .... | .... | 2,443 |
| 1945 | 3,121 | .... | .... | .... | .... | 3,121 |
| 1946 | 4,865 | .... | .... | .... | .... | 4,865 |
| 1947 | 5,033 | .... | .... | .... | .... | 5,033 |
| 1948 | 11,235 | .... | .... | .... | .... | 11,235 |
| 1949 | 5,063 | .... | .... | .... | .... | 5,063 |
| 1950 | 4,927 | .... | .... | .... | .... | 4,927 |
| 1951 | 4,752 | 3,727 | 1,245 | 532 | 5,504 | 10,256 |
| 1952 | 6,201 | 5,040 | 1,019 | 902 | 6,961 | 13,162 |
| 1953 | 13,532 | 4,794 | 1,117 | 721 | 6,632 | 20,164 |
| 1954 | 11,133 | 5,134 | 1,087 | 811 | 7,032 | 18,165 |
| 1955 | 13,203 | 6,980 | 1,236 | 1,807 | 10,203 | 23,406 |
| 1955: | | | | | | |
| Sept. | 12,595 | 6,448 | 975 | 1,527 | 8,950 | 21,545 |
| Oct. | 12,156 | 5,798 | 1,075 | 1,196 | 8,069 | 20,225 |
| Nov. | 12,616 | 6,307 | 1,089 | 1,174 | 8,570 | 21,186 |
| Dec. | 12,645 | 6,357 | 1,155 | 1,248 | 8,760 | 21,405 |
| 1956: | | | | | | |
| Jan. | 16,059 | 6,522 | 1,093 | 1,906 | 9,521 | 25,580 |
| Feb. | 16,735 | 7,011 | 1,162 | 1,943 | 10,116 | 26,851 |
| Mar. | 18,309 | 6,867 | 1,097 | 2,340 | 10,304 | 28,613 |
| Apr. | 21,384 | 7,415 | 1,163 | 2,272 | 10,850 | 32,234 |
| May | 21,234 | 7,516 | 1,218 | 2,194 | 10,928 | 32,162 |
| June | 21,033 | 7,447 | 1,328 | 2,086 | 10,861 | 31,894 |
| July | 19,952 | 7,288 | 1,109 | 2,009 | 10,406 | 30,358 |
| Aug. | 18,099 | 6,402 | 1,076 | 1,703 | 9,181 | 27,280 |
| Sept. | 15,403 | 6,625 | 1,328 | 1,523 | 9,476 | 24,879 |
| Oct. | 11,849 | 5,422 | 1,203 | 1,195 | 7,820 | 19,669 |

Source: U. S. Department of Commerce.
Note: (1) GR-S and Neoprene consumption estimated through 1950.

*for* **60** *Productive Years*

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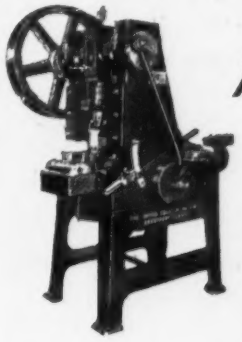
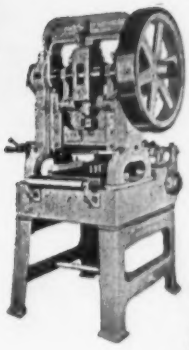
have meant quality, economy and dependability. Now, backed by this period of manufacturing know-how and service, COULTER sets the pace for another 60 years of even greater quality, economy, dependability.

* *Since 1896*

**COULTER — FOR CUTTING**

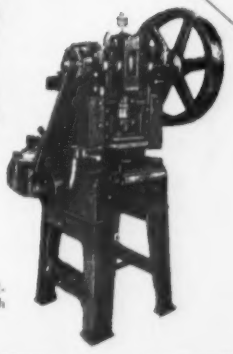


MODEL A1 ▲
Precision cutting for both high-speed production or short runs.



MODEL A2 ▶
Precision cutting for multiple heels, half and full soles with stock grain.

MODEL A2s
*(not illustrated)*
Precision cutting across grain of stock.



MODEL A3 ▶
Precision cutting of multiple heels and taps with or across stock grain.

*WRITE FOR ADDITIONAL INFORMATION*

the James COULTER Machine Co. BRIDGEPORT, CONN.

BRIDGEPORT CONNECTICUT

**CONTINUOUS IMPREGNATING & COATING SYSTEMS**

**. . . LARGE AND SMALL . . .**

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EXPORT REPRESENTATIVE: GILLESPIE & CO. OF N. Y., 96 WALL ST., NEW YORK 5, N. Y.

# Rubber Industry Employment Earnings and Hours

## All Rubber Products

| Mo. | 1955 Production Workers (thousands) | 1955 Average Weekly Earnings | 1955 Average Weekly Hours | 1955 Average Hourly Earnings | 1956 Production Workers (thousands) | 1956 Average Weekly Earnings | 1956 Average Weekly Hours | 1956 Average Hourly Earnings |
|---|---|---|---|---|---|---|---|---|
| Jan. | 208.5 | $83.84 | 41.3 | $2.03 | 229.5 | $87.91 | 40.7 | $2.16 |
| Feb. | 209.4 | 84.25 | 41.3 | 2.04 | 224.5 | 85.81 | 40.1 | 2.14 |
| Mar. | 211.6 | 83.64 | 41.0 | 2.04 | 220.8 | 84.93 | 39.5 | 2.15 |
| Apr. | 210.9 | 86.53 | 41.8 | 2.07 | 218.7 | 85.79 | 39.9 | 2.15 |
| May | 215.7 | 87.36 | 42.0 | 2.08 | 216.0 | 86.18 | 39.9 | 2.16 |
| June | 219.0 | 88.83 | 42.3 | 2.10 | 208.5 | 84.93 | 39.5 | 2.15 |
| July | 215.7 | 86.32 | 41.3 | 2.09 | 208.0 | 86.15 | 39.7 | 2.17 |
| Aug. | 216.8 | 86.32 | 41.3 | 2.09 | 210.8 | 87.64 | 40.2 | 2.18 |
| Sept. | 223.1 | 86.74 | 41.5 | 2.09 | 216.7 | 89.95 | 40.7 | 2.21 |
| Oct. | 226.4 | 89.04 | 42.0 | 2.12 | 217.7 | .... | .... | .... |
| Nov. | 231.2 | 92.01 | 42.4 | 2.17 | .... | .... | .... | .... |
| Dec. | 233.9 | 89.21 | 41.3 | 2.16 | .... | .... | .... | .... |

### Tires and Tubes

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Jan. | 85.3 | 97.41 | 41.1 | 2.37 | 93.7 | 101.00 | 40.4 | 2.50 |
| Feb. | 86.5 | 96.46 | 40.7 | 2.37 | 93.2 | 97.71 | 39.4 | 2.48 |
| Mar. | 87.4 | 95.51 | 40.3 | 2.37 | 92.6 | 97.25 | 38.9 | 2.50 |
| Apr. | 88.6 | 102.18 | 42.4 | 2.41 | 91.8 | 98.00 | 39.2 | 2.50 |
| May | 89.8 | 101.88 | 42.1 | 2.42 | 91.6 | 99.65 | 39.7 | 2.51 |
| June | 91.0 | 105.60 | 43.1 | 2.45 | 90.1 | 98.25 | 39.3 | 2.50 |
| July | 91.5 | 103.33 | 42.7 | 2.42 | 90.0 | 98.14 | 39.1 | 2.51 |
| Aug. | 91.0 | 102.72 | 42.1 | 2.44 | 89.8 | 101.20 | 40.0 | 2.53 |
| Sept. | 91.9 | 101.02 | 41.4 | 2.44 | 92.2 | 103.02 | 40.4 | 2.55 |
| Oct. | 92.3 | 103.74 | 42.0 | 2.47 | .... | .... | .... | .... |
| Nov. | 94.2 | 106.26 | 42.0 | 2.53 | .... | .... | .... | .... |
| Dec. | 94.7 | 99.50 | 39.8 | 2.50 | .... | .... | .... | .... |

### Rubber Footwear

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Jan. | 22.1 | 68.97 | 40.1 | 1.72 | 21.0 | 74.37 | 40.2 | 1.85 |
| Feb. | 21.5 | 69.72 | 40.3 | 1.73 | 20.9 | 74.74 | 40.4 | 1.85 |
| Mar. | 21.5 | 69.72 | 40.3 | 1.73 | 20.7 | 71.34 | 39.2 | 1.82 |
| Apr. | 21.3 | 70.82 | 40.7 | 1.74 | 20.3 | 72.25 | 39.7 | 1.82 |
| May | 21.3 | 70.07 | 40.5 | 1.73 | 20.0 | 72.25 | 39.7 | 1.82 |
| June | 21.6 | 71.34 | 41.0 | 1.74 | 19.4 | 70.53 | 39.4 | 1.79 |
| July | 21.8 | 70.99 | 40.8 | 1.74 | 18.9 | 71.28 | 39.6 | 1.80 |
| Aug. | 21.5 | 67.25 | 39.1 | 1.72 | 19.2 | 70.35 | 39.3 | 1.79 |
| Sept. | 23.5 | 67.60 | 39.3 | 1.72 | 19.3 | 71.71 | 39.4 | 1.82 |
| Oct. | 24.4 | 69.20 | 40.0 | 1.73 | .... | .... | .... | .... |
| Nov. | 25.5 | 77.89 | 42.1 | 1.85 | .... | .... | .... | .... |
| Dec. | 26.2 | 74.89 | 40.7 | 1.84 | .... | .... | .... | .... |

### All Other Rubber Products

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Jan. | 101.1 | 76.08 | 41.8 | 1.82 | 114.8 | 79.73 | 41.1 | 1.94 |
| Feb. | 101.4 | 76.86 | 42.0 | 1.83 | 110.4 | 77.95 | 40.6 | 1.92 |
| Mar. | 102.7 | 76.49 | 41.8 | 1.83 | 107.5 | 76.99 | 40.1 | 1.92 |
| Apr. | 101.0 | 76.54 | 41.6 | 1.84 | 106.6 | 77.95 | 40.6 | 1.92 |
| May | 104.6 | 78.68 | 42.3 | 1.86 | 104.4 | 76.99 | 40.1 | 1.92 |
| June | 106.4 | 77.93 | 41.9 | 1.86 | 99.0 | 76.02 | 39.8 | 1.91 |
| July | 102.4 | 74.37 | 40.2 | 1.85 | 99.1 | 77.78 | 40.3 | 1.93 |
| Aug. | 104.3 | 75.85 | 41.0 | 1.85 | 101.8 | 78.76 | 40.6 | 1.94 |
| Sept. | 107.7 | 78.96 | 42.0 | 1.88 | 105.2 | 81.38 | 41.1 | 1.98 |
| Oct. | 109.7 | 80.56 | 42.4 | 1.90 | .... | .... | .... | .... |
| Nov. | 111.5 | 83.03 | 42.8 | 1.94 | .... | .... | .... | .... |
| Dec. | 113.0 | 83.69 | 42.7 | 1.96 | .... | .... | .... | .... |

Source: U. S. Department of Labor.

Note: Data are based upon reports from cooperating establishments covering both full and part-time employees who work during, or received pay for, any part of the pay period ending nearest the 15th of the month. These employment series have been adjusted to first quarter 1954 benchmark levels indicated by data from government social insurance programs. Hours and earnings data pertain only to production and related workers.

# Spot Closing Cotton Prices

*(Middling Upland Grade—New York Market—in Cents)*

## Average Monthly Price Per Pound

| | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|---|---|
| Jan. | 33.37 | 31.89 | 45.04 | 42.96 | 33.24 | 34.15 | 35.07 | 35.24 |
| Feb. | 33.41 | 32.79 | (a) | 41.64 | 33.76 | 35.00 | 35.04 | 36.26 |
| Mar. | 33.44 | 32.65 | 46.06 | 41.70 | 34.10 | 35.23 | 34.33 | 36.70 |
| Apr. | 33.84 | 33.23 | 46.06 | 41.79 | 33.85 | 35.22 | 34.23 | 36.81 |
| May | 33.73 | 33.64 | 46.06 | 39.98 | 34.30 | 35.34 | 34.80 | 36.65 |
| June | 33.56 | 34.61 | 46.06 | 41.31 | 34.11 | 35.17 | 34.83 | 36.67 |
| July | 32.99 | 38.11 | 46.21 | 40.37 | 34.20 | 35.37 | 34.61 | 35.43 |
| Aug. | 32.06 | 38.93 | 35.93 | 40.42 | 33.82 | 35.19 | 34.53 | 34.31 |
| Sept. | 30.94 | 41.62 | 36.20 | 39.75 | 33.69 | 35.46 | 33.85 | 34.35 |
| Oct. | 30.32 | 40.66 | 38.13 | 37.52 | 33.53 | 35.24 | 33.93 | 34.45 |
| Nov. | 30.52 | 43.11 | 42.70 | 35.59 | 33.60 | 34.80 | 34.87 | 34.56 |
| Dec. | 31.08 | 43.37 | 43.32 | 33.76 | 33.52 | 35.03 | 34.95 | 34.56 |
| Average for Year | 32.44 | 37.05 | 42.43 | 39.71 | 33.81 | 35.10 | 34.59 | 35.50 |

Note: The Government established a ceiling price of 45.76c for spot cotton on March 3, 1951. (a) Trading suspended during February.

# Production Index for the Rubber Industry

## (1947-1949 = 100)

### (Based on man-hours)

| | 1954 | 1955 | 1956 | | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|---|
| Jan. | 114 | 145 | 147 | July | 85 | 137 | 119 |
| Feb. | 114 | 144 | 140 | Aug. | 94 | 138 | 132 |
| Mar. | 118 | 146 | 135 | Sept. | 118 | 142 | 133 |
| Apr. | 116 | 147 | 137 | Oct. | 132 | 147 | 133 |
| May | 121 | 146 | 131 | Nov. | 124 | 147 | .. |
| June | 121 | 149 | 122 | Dec. | 128 | 144 | ... |

# Sales by the Rubber Industry

## (in Millions of Dollars*)

| | 1954 | 1955 | 1956 | | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|---|
| Jan. | 361 | 424 | 415 | July | 393 | 471 | 459 |
| Feb. | 360 | 440 | 445 | Aug. | 352 | 456 | 436 |
| Mar. | 378 | 466 | 451 | Sept. | 346 | 456 | 429 |
| Apr. | 382 | 445 | 445 | Oct. | 346 | 447 | ... |
| May | 378 | 465 | 464 | Nov. | 404 | 482 | ... |
| June | 385 | 465 | 450 | Dec. | 417 | 465 | ... |

# Rubber Manufacturers' Inventories

## (in Millions of Dollars*)

| | 1954 | 1955 | 1956 | | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|---|
| Jan. | 835 | 790 | 935 | July | 787 | 853 | 987 |
| Feb. | 848 | 782 | 970 | Aug. | 754 | 863 | 1,007 |
| Mar. | 844 | 805 | 979 | Sept. | 799 | 874 | 1,007 |
| Apr. | 813 | 784 | 970 | Oct. | 835 | 902 | ... |
| May | 798 | 810 | 985 | Nov. | 811 | 935 | ... |
| June | 817 | 850 | 975 | Dec. | 821 | 934 | ... |

Source: U. S. Department of Commerce.
Notes: * Adjusted for seasonal variation.

# No. 1 R.S.S.—Annual Average Prices

*(New York Market—Cents per Pound)*

| Year | High | Low | Avg. | Year | High | Low | Avg. |
|---|---|---|---|---|---|---|---|
| 1915 | 79 | 58½ | 65.85 | 1936 | 23 | 13½ | 16.41 |
| 1916 | 102 | 55 | 72.50 | 1937 | 26⅜ | 14 | 19.39 |
| 1917 | 90 | 52 | 72.23 | 1938 | 17⅞ | 10¼ | 14.64 |
| 1918 | 70 | 40 | 60.15 | 1939 | 24 | 14¼ | 17.57 |
| 1919 | 57 | 38½ | 48.70 | 1940 | 24 | 18¾ | 20.10 |
| 1920 | 56½ | 16 | 36.30 | 1941 | 24⅞ | 19⅛ | 22.40 |
| 1921 | 21¼ | 11½ | 16.36 | 1942 | 22½ | 22½ | 22.50 |
| 1922 | 28⅜ | 13⅜ | 17.50 | 1943 | 22½ | 22½ | 22.50 |
| 1923 | 37⅛ | 24¼ | 29.45 | 1944 | 22½ | 22½ | 22.50 |
| 1924 | 40⅞ | 17⅜ | 26.20 | 1945 | 22½ | 22½ | 22.50 |
| 1925 | 121 | 34⅜ | 72.46 | 1946 | 22½ | 22½ | 22.50 |
| 1926 | 88½ | 36¾ | 48.50 | 1947 | 25 | 14 | 20.00 |
| 1927 | 41¾ | 33 | 37.72 | 1948 | 25 | 18 | 21.99 |
| 1928 | 41¼ | 17 | 22.48 | 1949 | 19¾ | 15⅞ | 17.57 |
| 1929 | 26⅛ | 15½ | 20.55 | 1950 | 86 | 18 | 41.10 |
| 1930 | 16½ | 7½ | 11.98 | 1951 | 76 | 52 | (a) |
| 1931 | 8¾ | 4¼ | 6.17 | 1952* | 33 | 26½ | 29.15 |
| 1932 | 4¾ | 2½ | 3.49 | 1953 | 31⅜ | 19⅞ | 24.21 |
| 1933 | 9⅞ | 2⅜ | 5.96 | 1954 | 34½ | 19½ | 23.61 |
| 1934 | 15⅞ | 8¾ | 12.92 | 1955 | 52 | 29⅜ | 39.16 |
| 1935 | 13¾ | 10½ | 12.37 | 1956 | 45 | 26½ | 34.24 |

Note: Price was fixed by Government on August 6, 1941, at 22½c a pound for non-war uses. Free trading was resumed May 1, 1947. (a) Free trading suspended March 31, 1951. GSA selling price ranged between 52 and 66c during balance of year. * Free trading was resumed on July 1, 1952; figures represent only July through December, 1952.

# No. 1 R.S.S.—Monthly Average Prices

*(New York Market—Cents per pound)*

| | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|---|---|
| Jan. | 19.23 | 18.33 | 71.21 | .... | 29.40 | 20.22 | 33.92 | 41.70 |
| Feb. | 18.49 | 19.40 | 73.61 | .... | 27.57 | 19.98 | 34.90 | 36.46 |
| Mar. | 19.08 | 19.86 | 72.05 | .... | 26.59 | 20.16 | 31.08 | 33.68 |
| Apr. | 18.53 | 23.51 | .... | .. | 24.66 | 22.06 | 31.75 | 31.74 |
| May | 17.92 | 28.07 | .. | .... | 25.52 | 21.96 | 31.35 | 29.61 |
| June | 16.36 | 30.92 | .... | .... | 24.42 | 23.01 | 34.74 | 30.54 |
| July | 16.45 | 39.10 | .... | 30.52 | 23.64 | 24.12 | 40.84 | 33.91 |
| Aug. | 16.60 | 51.63 | .... | 29.36 | 23.36 | 23.26 | 45.85 | 35.69 |
| Sept. | 17.58 | 55.98 | .... | 27.42 | 23.06 | 23.99 | 48.27 | 32.64 |
| Oct. | 16.31 | 62.19 | .... | 27.26 | 20.82 | 26.57 | 43.81 | 32.68 |
| Nov. | 16.70 | 73.05 | .... | 29.25 | 20.58 | 28.07 | 44.95 | 35.18 |
| Dec. | 17.53 | 71.20 | .... | 31.26 | 20.92 | 29.88 | 48.40 | 37.01 |
| Average for Year | 17.57 | 41.10 | (*) | 29.15 | 24.21 | 23.61 | 39.16 | 34.24 |

Note: (*) Free trading suspended March 31, 1951, and resumed on July 1, 1952.

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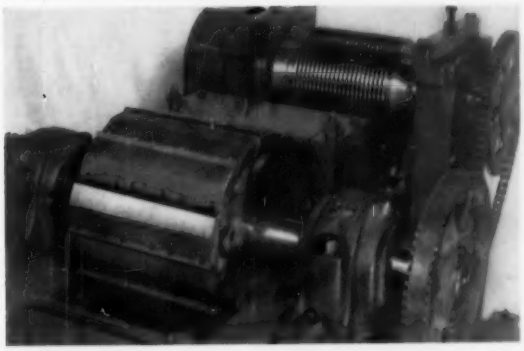
## CUT UNIFORM PELLETS FROM PLASTIC SHEETS OR RODS—



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## Automotive Pneumatic Casings

*(Thousands of Units)*

| | Shipments | | | | | |
|---|---|---|---|---|---|---|
| | Original Equipment | Replacement | Export | Total | Production | Inventory End of Period |
| 1946 (total) .... | 15,310 | 65,490 | 1,512 | 82,312 | 82,298 | 2,448 |
| Passenger Car. | 11,086 | 54,684 | 653 | 66,423 | 66,466 | 1,763 |
| Truck and Bus | 4,224 | 10,806 | 859 | 15,889 | 15,832 | 685 |
| 1947 (total) .... | 25,056 | 62,871 | 3,256 | 91,183 | 95,550 | 6,949 |
| Passenger Car. | 19,644 | 52,857 | 1,608 | 74,109 | 77,795 | 5,444 |
| Truck and Bus | 5,412 | 10,014 | 1,648 | 17,074 | 17,755 | 1,505 |
| 1948 (total) .... | 26,845 | 49,148 | 1,787 | 77,781 | 81,314 | 10,698 |
| Passenger Car. | 21,589 | 41,295 | 656 | 63,540 | 66,738 | 8,773 |
| Truck and Bus | 5,256 | 7,853 | 1,132 | 14,241 | 14,576 | 1,925 |
| 1949 (total) .... | 31,584 | 43,466 | 1,467 | 76,517 | 76,369 | 10,638 |
| Passenger Car. | 28,129 | 36,440 | 509 | 65,077 | 65,140 | 8,904 |
| Truck and Bus | 3,456 | 7,026 | 958 | 11,440 | 11,228 | 1,734 |
| 1950 (total) .... | 41,349 | 56,808 | 1,430 | 99,587 | 92,754 | 3,794 |
| Passenger Car. | 36,678 | 47,103 | 642 | 84,423 | 78,598 | 3,050 |
| Truck and Bus | 4,671 | 9,705 | 788 | 15,164 | 14,156 | 743 |
| 1951 (total) .... | 32,153 | 44,612 | 1,677 | 78,442 | 83,405 | 8,765 |
| Passenger Car. | 26,729 | 34,226 | 723 | 61,678 | 65,546 | 6,973 |
| Truck and Bus | 5,424 | 10,386 | 954 | 16,764 | 17,859 | 1,791 |
| 1952 (total) .... | 29,484 | 54,342 | 1,520 | 85,346 | 90,411 | 14,110 |
| Passenger Car. | 24,106 | 45,458 | 741 | 70,305 | 74,341 | 11,251 |
| Truck and Bus | 5,378 | 8,884 | 779 | 15,041 | 16,070 | 2,859 |
| 1953 (total) .... | 37,949 | 55,124 | 1,543 | 94,617 | 96,150 | 15,720 |
| Passenger Car. | 33,106 | 45,798 | 809 | 79,713 | 81,455 | 13,044 |
| Truck and Bus | 4,843 | 9,326 | 734 | 14,904 | 14,696 | 2,676 |
| 1954 (total) .... | 33,333 | 55,155 | 1,753 | 90,241 | 89,141 | 14,762 |
| Passenger Car. | 29,741 | 47,044 | 928 | 77,713 | 76,794 | 12,217 |
| Truck and Bus | 3,591 | 8,111 | 826 | 12,528 | 12,347 | 2,545 |
| 1955 (total) .... | 47,374 | 59,246 | 1,879 | 108,499 | 112,178 | 18,778 |
| Passenger Car. | 42,574 | 50,189 | 966 | 93,730 | 97,223 | 15,963 |
| Truck and Bus | 4,800 | 9,057 | 912 | 14,769 | 14,955 | 2,815 |
| 1956: | | | | | | |
| Jan. (total) .... | 3,402 | 4,669 | 131 | 8,203 | 8,979 | 19,517 |
| Passenger Car. | 2,958 | 4,040 | 66 | 7,064 | 7,661 | 16,546 |
| Truck and Bus | 444 | 629 | 65 | 1,139 | 1,318 | 2,971 |
| Feb. (total) .... | 3,342 | 3,952 | 178 | 7,473 | 8,897 | 20,933 |
| Passenger Car. | 2,919 | 3,387 | 90 | 6,396 | 7,571 | 17,701 |
| Truck and Bus | 424 | 565 | 88 | 1,077 | 1,326 | 3,232 |
| Mar. (total) .... | 3,466 | 5,034 | 127 | 8,627 | 9,193 | 21,562 |
| Passenger Car. | 3,027 | 4,372 | 65 | 7,464 | 7,812 | 18,096 |
| Truck and Bus | 439 | 662 | 62 | 1,163 | 1,382 | 3,465 |
| Apr. (total) .... | 3,217 | 5,761 | 141 | 9,119 | 8,834 | 21,132 |
| Passenger Car. | 2,787 | 4,994 | 67 | 7,847 | 7,530 | 17,649 |
| Truck and Bus | 430 | 767 | 74 | 1,271 | 1,303 | 3,483 |
| May (total) .... | 2,770 | 5,980 | 130 | 8,880 | 8,986 | 21,296 |
| Passenger Car. | 2,349 | 5,203 | 65 | 7,617 | 7,628 | 17,714 |
| Truck and Bus | 421 | 777 | 65 | 1,264 | 1,358 | 3,582 |
| June (total) .... | 2,533 | 6,627 | 129 | 9,289 | 7,929 | 19,947 |
| Passenger Car. | 2,162 | 5,659 | 64 | 7,885 | 6,600 | 16,443 |
| Truck and Bus | 372 | 968 | 65 | 1,404 | 1,329 | 3,503 |
| July (total) .... | 2,833 | 6,319 | 145 | 9,298 | 6,741 | 17,394 |
| Passenger Car. | 2,471 | 5,482 | 73 | 8,026 | 5,668 | 14,088 |
| Truck and Bus | 362 | 837 | 72 | 1,271 | 1,073 | 3,306 |
| Aug. (total) .... | 2,302 | 6,178 | 163 | 8,644 | 8,050 | 16,794 |
| Passenger Car. | 1,953 | 5,359 | 77 | 7,389 | 6,897 | 13,578 |
| Truck and Bus | 349 | 819 | 86 | 1,254 | 1,153 | 3,217 |
| Sept. (total) .... | 1,553 | 5,238 | 162 | 6,952 | 7,800 | 17,648 |
| Passenger Car. | 1,261 | 4,427 | 70 | 5,758 | 6,647 | 14,468 |
| Truck and Bus | 291 | 811 | 92 | 1,194 | 1,153 | 3,180 |
| Oct. (total) .... | 2,908 | 4,703 | 165 | 7,776 | 8,799 | 18,775 |
| Passenger Car. | 2,530 | 3,854 | 87 | 6,471 | 7,526 | 15,607 |
| Truck and Bus | 378 | 849 | 78 | 1,305 | 1,273 | 3,168 |

Source: The Rubber Manufacturers Association, Inc.

## Automobile Production in U. S.

**(Civilian Production Only)**

| Year | Passenger Cars | Trucks | Total | Year | Passenger Cars | Trucks | Total |
|---|---|---|---|---|---|---|---|
| 1936 | 3,669,528 | 781,862 | 4,451,390 | 1946 | 2,148,699 | 930,760 | 3,079,429 |
| 1937 | 3,915,889 | 892,382 | 4,808,271 | 1947 | 3,558,178 | 1,220,634 | 4,778,812 |
| 1938 | 2,000,985 | 485,852 | 2,486,837 | 1948 | 3,909,270 | 1,363,856 | 5,273,126 |
| 1939 | 2,866,796 | 704,308 | 3,571,104 | 1949 | 5,108,841 | 1,123,736 | 6,232,577 |
| 1940 | 3,692,328 | 721,637 | 4,413,965 | 1950 | 6,665,836 | 1,332,263 | 7,998,099 |
| 1941 | 3,744,500 | 875,381 | 4,619,681 | 1951 | 5,337,729 | 1,420,432 | 6,758,161 |
| 1942 | 220,814 | 133,083 | 353,897 | 1952 | 4,320,794 | 1,212,790 | 5,533,584 |
| 1943 | 0 | 4,501 | 4,501 | 1953 | 6,121,787 | 1,202,196 | 7,323,983 |
| 1944 | 0 | 124,819 | 124,819 | 1954 | 5,558,897 | 1,038,045 | 6,596,942 |
| 1945 | 83,792 | 313,643 | 397,435 | 1955 | 7,920,186 | 1,245,018 | 9,165,204 |
| 1955: | | | | | | | |
| Jan. | 635,513 | 89,676 | 725,189 | July | 658,736 | 109,589 | 768,325 |
| Feb. | 677,705 | 67,061 | 744,766 | Aug. | 620,610 | 95,119 | 715,729 |
| Mar. | 791,280 | 102,992 | 894,272 | Sept. | 467,845 | 91,894 | 559,739 |
| Apr. | 753,434 | 127,887 | 881,321 | Oct. | 505,177 | 95,610 | 600,787 |
| May | 721,139 | 127,941 | 849,080 | Nov. | 745,993 | 114,448 | 860,441 |
| June | 647,658 | 119,215 | 766,873 | Dec. | 695,096 | 103,586 | 799,092 |
| 1956: | | | | | | | |
| Jan. | 591,032 | 98,968 | 690,000 | July | 440,980 | 80,731 | 521,711 |
| Feb. | 560,924 | 102,384 | 663,308 | Aug. | 417,020 | 85,827 | 502,847 |
| Mar. | 583,169 | 106,379 | 689,548 | Sept. | 203,888 | 71,299 | 275,187 |
| Apr. | 552,881 | 101,081 | 653,962 | Oct. | 352,140 | 92,684 | 444,824 |
| May | 474,010 | 96,114 | 570,124 | Nov. | 576,708 | 90,246 | 666,954 |
| June | 445,758 | 91,791 | 537,549 | Dec. | .... | ..... | ... |

Source: Automobile Manufacturers Association.
Note: Figures are based on factory sales. Revisions are made from time to time in these figures and the latest issue should be consulted for accuracy.

## Automotive Inner Tubes

*(Thousands of Units)*

| | Shipments | | | | | |
|---|---|---|---|---|---|---|
| Year | Original Equipment | Replacement | Export | Total | Production | Inventory End of Period |
| 1946 | 15,327 | 59,357 | 1,424 | 76,108 | 77,251 | 3,820 |
| 1947 | 25,046 | 46,560 | 2,483 | 74,088 | 79,181 | 8,059 |
| 1948 | 26,833 | 40,548 | 1,119 | 68,499 | 70,033 | 9,641 |
| 1949 | 31,521 | 31,450 | 887 | 63,858 | 65,114 | 10,657 |
| 1950 | 41,240 | 42,671 | 811 | 84,723 | 80,179 | .. |
| 1951 | 32,151 | 32,284 | 1,071 | 65,507 | 67,249 | 10,094 |
| 1952 | 29,451 | 32,985 | 1,014 | 63,449 | 65,073 | 12,036 |
| 1953 | 37,957 | 36,072 | 878 | 74,907 | 74,425 | 11,874 |
| 1954 | 25,071 | 35,576 | 945 | 61,593 | 48,279 | 9,519 |
| 1955 | 5,001 | 33,387 | 1,001 | 39,389 | 35,900 | 6,833 |
| 1956: | | | | | | |
| Jan. | 273 | 3,263 | 71 | 3,608 | 2,917 | 6,294 |
| Feb. | 273 | 2,548 | 100 | 2,921 | 2,969 | 6,547 |
| Mar. | 281 | 2,587 | 93 | 2,962 | 3,347 | 6,848 |
| Apr. | 265 | 2,444 | 88 | 2,797 | 3,094 | 7,312 |
| May | 280 | 2,515 | 83 | 2,878 | 3,093 | 7,657 |
| June | 269 | 3,023 | 79 | 3,370 | 2,837 | 7,349 |
| July | 247 | 3,055 | 82 | 3,384 | 2,300 | 6,418 |
| Aug. | 242 | 2,954 | 99 | 3,295 | 2,795 | 5,962 |
| Sept. | 213 | 2,472 | 91 | 2,777 | 2,773 | 6,056 |
| Oct. | 261 | 2,518 | 98 | 2,877 | 3,025 | 6,469 |

Source: The Rubber Manufacturers Association, Inc.

## Vinyl and Vinyl Copolymer Resins—Sales

*(Thousands of Pounds—Resin Content)*

| | Polyvinyl Chloride and Copolymer Resins | | | | | | | All Other Vinyl Resins | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Film | Sheeting | Molding & Extrusion | Textile & Paper Treating | Flooring | Protective Coatings | All Other Uses | Adhesives | All Other Uses | Grand Total |
| 1953 | 63,691 | 62,385 | 129,215 | 52,353 | 22,152 | 22,823 | 27,790 | 22,411 | 77,478 | 480,299 |
| 1954 | 69,943 | 56,588 | 147,284 | 49,546 | 34,890 | 23,676 | 35,148 | 26,609 | 74,090 | 517,773 |
| 1955 | 83,276 | 51,424 | 183,736 | 64,223 | 56,357 | 27,439 | 53,868 | 31,853 | 105,644 | 657,821 |
| 1955: | | | | | | | | | | |
| Sept. | 6,983 | 4,166 | 15,412 | 5,582 | 4,707 | 2,313 | 4,017 | 3,072 | 9,129 | 55,382 |
| Oct. | 7,498 | 4,581 | 16,067 | 6,043 | 5,369 | 2,490 | 6,318 | 2,670 | 9,836 | 60,672 |
| Nov. | 6,855 | 4,771 | 18,224 | 6,271 | 4,945 | 2,147 | 6,818 | 2,945 | 9,831 | 62,807 |
| Dec. | 6,273 | 4,585 | 16,682 | 6,089 | 4,214 | 1,980 | 5,458 | 2,190 | 10,087 | 57,558 |
| 1956: | | | | | | | | | | |
| Jan. | 6,496 | 4,928 | 16,842 | 6,176 | 5,181 | 2,289 | 6,584 | 3,331 | 10,628 | 62,455 |
| Feb. | 6,849 | 5,296 | 16,509 | 5,187 | 4,894 | 1,792 | 6,185 | 2,718 | 8,696 | 58,126 |
| Mar. | 7,388 | 5,280 | 16,965 | 4,962 | 5,016 | 2,274 | 5,811 | 3,162 | 9,364 | 60,222 |
| Apr. | 6,247 | 4,674 | 15,560 | 4,646 | 4,494 | 2,344 | 7,295 | 3,114 | 11,612 | 59,986 |
| May | 5,948 | 4,403 | 16,470 | 4,322 | 5,075 | 2,458 | 6,087 | 3,288 | 10,158 | 58,209 |
| June | 5,345 | 4,217 | 14,946 | 4,727 | 5,316 | 2,364 | 5,228 | 2,863 | 7,731 | 52,737 |
| July | 4,722 | 3,714 | 15,203 | 4,298 | 4,231 | 2,681 | 2,321 | 3,165 | 8,146 | 48,481 |
| Aug. | 6,497 | 4,787 | 17,490 | 5,727 | 6,798 | 2,416 | 7,228 | 3,256 | 9,213 | 63,412 |
| Sept. | 7,159 | 4,194 | 17,228 | 5,198 | 5,526 | 2,025 | 5,945 | 2,893 | 9,291 | 59,458 |
| Oct. | 8,581 | 5,341 | 21,339 | 6,384 | 6,790 | 2,568 | 5,984 | 3,231 | 10,773 | 70,992 |

Source: Chemical Division, U. S. Tariff Commission.

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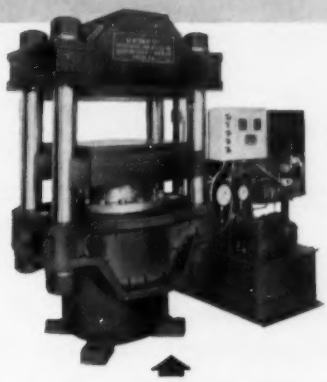

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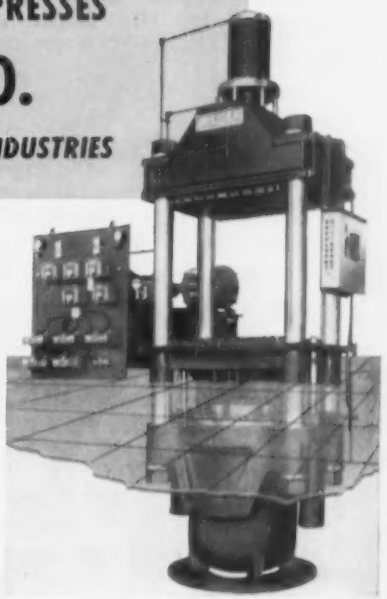

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## Various Compounding Materials Consumed by the Rubber Industry

| Material | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 |
|---|---|---|---|---|---|---|---|
| Antimony, Primary: | | | | | | | |
| Short tons | 55 | 103[c] | 19[c] | 66[c] | 20[c] | 49[c] | 45[c] |
| % of total | .005 | .007 | .001 | .004 | .001 | .004 | .004 |
| Asphalt:[a] | | | | | | | |
| Short tons | 18,050 | 26,819 | 21,414 | 33,288 | ..... | ..... | ..... |
| % of total | 0.3 | 0.3 | 0.3 | 0.4 | ..... | ..... | ..... |
| Barite (Barytes): | | | | | | | |
| Short tons | 14,000 | 19,000 | 15,000 | 18,000 | 21,000 | 20,000 | ..... |
| % of total | 2.53 | 3.31 | 2.13 | 2.0 | 2.0 | 2.0 | ..... |
| Carbon Black: | | | | | | | |
| Short tons | 383,565 | 515,184 | 530,614 | 537,273 | 566,797 | 511,813 | ..... |
| % of total | 93.3 | 92.9 | 93.9 | 93.1 | 94.4 | ..... | ..... |
| Clay, Kaolin: | | | | | | | |
| Short tons | 197,341 | 263,306 | 231,331 | 240,982 | 241,052 | 247,431 | ..... |
| % of total | 13.1 | 15.0 | 12.7 | 13.2 | 12.8 | 13.2 | ..... |
| Clay, Fire & Stoneware: | | | | | | | |
| Short tons | 27,148 | 9,500 | ..... | 9,322 | 18,475 | 8,781 | ..... |
| % of total | 0.3 | 0.1 | ..... | 0.1 | .2 | .1 | ..... |
| Lime: | | | | | | | |
| Short tons | 715 | 908 | 1,126 | 2,000 | 1,631 | 1,555 | ..... |
| % of total | .0002 | .0002 | (d) | (d) | (d) | (d) | ..... |
| Litharge: | | | | | | | |
| Short tons | 1,398 | 3,047 | 2,641 | 2,109 | 2,230 | 1,768 | ..... |
| % of total | 1.2 | 1.7 | 1.7 | 1.5 | 1.4 | 1.3 | ..... |
| Lithopone: | | | | | | | |
| Short tons | 3,245 | 4,092 | 3,295 | 1,523 | 1,723 | 1,701 | ..... |
| % of total | 4.1 | 3.9 | 3.2 | 2.5 | 3.3 | 3.9 | ..... |
| Mica, Ground: | | | | | | | |
| Short tons | 3,856 | 5,776 | 6,551 | 5,126 | 5,668 | 5,021 | ..... |
| % of total | 7.0 | 8.0 | 9.0 | 7.0 | 7.8 | 6.3 | ..... |
| Sulfur: | | | | | | | |
| Short tons | 59,360 | 75,000 | 75,000 | 75,000 | 80,000 | ..... | ..... |
| % of total | 1.3 | 1.3 | 1.4 | 1.4 | 1.4 | ..... | ..... |
| Talc:[b] | | | | | | | |
| Short tons | 53,400 | 75,900 | 70,970 | 64,476 | 32,137 | 30,621 | ..... |
| % of total | 12.0 | 12.0 | 11.2 | 10.9 | 0.7 | .07 | ..... |
| Zinc Oxide: | | | | | | | |
| Short tons | 58,496 | 82,944 | 71,507 | 72,774 | 78,439 | 71,058 | ..... |
| % of total | 52.5 | 51.6 | 48.4 | 51.2 | 52.7 | 50.7 | ..... |

Source: U. S. Bureau of Mines.
Notes: (a) Solid and semi-solid products of less than 200 penetration. (b) Includes prophyllite and ground soapstone. (c) Does not include precipitated antimony sulfide as in previous years. (d) Negligible.

## Reclaimed Rubber

### (Including Natural and Synthetic)

*(All Quantities in Long Tons)*

| Year | New Supply | Consumption: Tons | Consumption: % to Crude[a] | Exports | Stocks On Hand at End of Period |
|---|---|---|---|---|---|
| 1941 | 274,202 | 251,231 | 32.2 | 13,851 | 41,750 |
| 1942 | 286,007[b] | 254,820 | 64.6 | 30,405 | 42,532 |
| 1943 | 304,058[c] | 291,082 | 59.6 | 15,678 | 46,201 |
| 1944 | 260,631[d] | 251,083 | 35.3 | 11,800 | 43,832 |
| 1945 | 243,309 | 241,036 | 30.2 | 13,413 | 28,155 |
| 1946 | 295,612 | 275,410 | 26.5 | 14,461 | 33,666 |
| 1947 | 291,395 | 288,395 | 24.8 | 14,556 | 35,943 |
| 1948 | 266,861 | 261,113 | 24.4 | 11,428 | 32,630 |
| 1949 | 224,029 | 226,679 | 22.5 | 10,637 | 28,263 |
| 1950 | 314,008 | 303,733 | 24.1 | 11,740 | 35,708 |
| 1951 | 366,700 | 346,121 | 26.6 | 14,722 | 45,082 |
| 1952 | 274,981 | 280,002 | 22.2 | 11,180 | 30,664 |
| 1953 | 298,336 | 285,050 | 21.3 | 11,597 | 32,319 |
| 1954 | 258,101 | 249,049 | 20.2 | 10,232 | 30,746 |
| 1955 | 326,649 | 312,781 | 20.4 | 13,988 | 31,498 |
| 1955: | | | | | |
| Sept. | 26,512 | 26,340 | 20.6 | 1,018 | 27,110 |
| Oct. | 28,038 | 26,597 | 19.7 | 1,381 | 27,565 |
| Nov. | 29,124 | 27,229 | 20.3 | 1,313 | 28,473 |
| Dec. | 28,153 | 24,604 | 20.0 | 1,347 | 31,100 |
| 1956: | | | | | |
| Jan. | 26,205 | 25,827 | 19.6 | 1,382 | 31,640 |
| Feb. | 27,108 | 25,571 | 20.3 | 1,115 | 31,875 |
| Mar. | 28,468 | 26,176 | 20.3 | 1,163 | 33,326 |
| Apr. | 26,933 | 23,999 | 19.6 | 1,179 | 34,360 |
| May | 25,485 | 23,560 | 18.9 | 1,297 | 34,863 |
| June | 22,153 | 20,049 | 18.4 | 1,264 | 35,647 |
| July | 19,776 | 18,099 | 18.7 | 952 | 35,703 |
| Aug. | 21,724 | 21,498 | 18.0 | 1,076 | 35,512 |
| Sept. | 22,368 | 20,242 | 17.9 | 1,015 | 36,527 |
| Oct. | 26,241 | 23,632 | 17.9 | ..... | 37,507 |

Source: U. S. Department of Commerce.
Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. (a) Includes natural and synthetic rubber. (b) Includes 893 tons of imports. (c) Includes 67 tons of imports. (d) Includes 21 tons of imports.

## Cotton, Rayon and Nylon Tire Fabrics

*(In Thousands of Pounds)*

| | Production: Rayon Tire Cord Not Woven | Production: Rayon Tire Cord Woven | Production: Cotton and Nylon Cord & Fabric[a] | Production: Chafer Fabrics (all fibers) | Production: Total Tire Cord and Fabric | Stocks[b]: Cotton and Nylon Cord & Fabric | Stocks[b]: Rayon Cord and Fabric |
|---|---|---|---|---|---|---|---|
| 1955: | | | | | | | |
| Jan.-Mar. | 20,299 | 79,191 | 14,870 | 12,763 | 127,123 | 6,863 | 44,239 |
| Apr.-June | 21,550 | 81,036 | 18,898 | 12,724 | 134,208 | 8,870 | 40,689 |
| July-Sept. | 20,740 | 81,996 | 16,093 | 12,941 | 131,770 | 9,679 | 47,272 |
| Oct.-Dec. | 24,343 | 77,600 | 15,754 | 12,333 | 130,030 | 9,182 | 46,636 |
| Total | 86,932 | 319,823 | 65,615 | 50,761 | 523,131 | 34,594 | 178,836 |
| 1956: | | | | | | | |
| Jan.-Mar. | 23,707 | 74,833 | 29,298 | 14,176 | 129,199 | 10,185 | 48,936 |
| Apr.-June | 21,557 | 60,644 | 28,752 | 11,628 | 112,546 | 10,433 | 43,737 |
| July-Sept. | 18,698 | 57,076 | 26,328 | 8,525 | 102,669 | 11,166 | 44,795 |
| Oct.-Dec. | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

Source: Bureau of the Census, U. S. Department of Commerce.
Notes: (a) Combined to avoid disclosing figures for individual companies. (b) At end of period.

## Gasoline Consumption

*(In Thousands of Barrels of 42 Gallons)*

| | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|---|
| Jan. | 66,981 | 80,670 | 86,863 | 89,634 | 89,852 | 96,397 | 100,642 |
| Feb. | 53,274 | 72,864 | 82,043 | 86,458 | 86,206 | 88,464 | 98,088 |
| Mar. | 78,780 | 86,962 | 87,065 | 98,158 | 101,549 | 105,684 | 113,128 |
| Apr. | 80,350 | 87,573 | 98,563 | 102,044 | 103,866 | 111,116 | 113,034 |
| May | 89,035 | 100,266 | 101,137 | 105,918 | 104,418 | 115,707 | 124,114 |
| June | 90,174 | 96,364 | 99,305 | 114,703 | 113,037 | 120,710 | 127,413 |
| July | 91,677 | 100,567 | 105,307 | 112,960 | 112,231 | 115,653 | 121,243 |
| Aug. | 94,507 | 101,453 | 102,954 | 109,124 | 110,223 | 121,816 | 126,207 |
| Sept. | 86,725 | 91,891 | 100,095 | 106,158 | 104,706 | 113,379 | ..... |
| Oct. | 89,067 | 100,209 | 103,689 | 106,037 | 105,607 | 112,558 | ..... |
| Nov. | 82,688 | 88,581 | 91,326 | 99,210 | 102,393 | 109,212 | ..... |
| Dec. | 81,032 | 84,551 | 95,817 | 100,225 | 104,258 | 111,034 | ..... |
| Total | 994,290 | 1,091,951 | 1,154,254 | 1,230,629 | 1,238,346 | 1,321,730 | ..... |

Source: U. S. Bureau of Mines.

## U. S. Gross Imports of Balata, Jelutong, Gutta-Percha, etc.

*(All Quantities in Long Tons)*

| Year | Balata: Tons | Balata: Value | Jelutong: Tons | Jelutong: Value | Gutta-Percha & Other Guttas: Tons | Gutta-Percha & Other Guttas: Value |
|---|---|---|---|---|---|---|
| 1944 | 1,012 | $660,805 | 88 | $45,578 | 10 | $4,999 |
| 1945 | 1,361 | 907,253 | .... | ..... | 36 | 21,970 |
| 1946 | 2,281 | 2,233,065 | 304 | 256,169 | 423 | 458,064 |
| 1947 | 1,982 | 2,276,531 | 2,878 | 1,496,887 | 392 | 779,591 |
| 1948 | 1,195 | 805,078 | 3,401 | 2,377,765 | 423 | 542,788 |
| 1949 | 1,391 | 814,554 | 1,043 | 834,978 | 197 | 189,021 |
| 1950 | 2,117 | 1,589,885 | 1,789 | 1,515,162 | 541 | 745,418 |
| 1951 | 2,452 | 1,973,271 | 1,669 | 2,608,359 | 383 | 430,539 |
| 1952 | 988 | 762,994 | 1,636 | 2,094,983 | 282 | 385,890 |
| 1953 | 1,619 | 866,248 | 1,027 | 1,166,837 | 235 | 303,116 |
| 1954 | 949 | 504,065 | 2,196 | 2,624,926 | 417 | 511,055 |
| 1955 | 1,022 | 967,369 | 1,679 | 1,731,821 | 284 | 318,115 |
| 1955: | | | | | | |
| Nov. | 11 | 94,967 | 97 | 97,981 | 12 | 21,302 |
| Dec. | 66 | 51,938 | 138 | 114,286 | 5 | 3,318 |
| 1956: | | | | | | |
| Jan. | 49 | 30,670 | 112 | 99,777 | 9 | 18,066 |
| Feb. | 68 | 57,777 | 140 | 137,190 | 11 | 13,642 |
| Mar. | 164 | 116,302 | 135 | 123,366 | 17 | 21,620 |
| Apr. | 93 | 62,425 | 111 | 105,593 | 34 | 48,766 |
| May | 31 | 22,595 | 152 | 159,121 | 33 | 34,803 |
| June | 99 | 78,150 | 248 | 243,307 | 15 | 14,008 |
| July | 46 | 53,177 | 147 | 152,950 | 13 | 31,774 |
| Aug. | 76 | 89,476 | 212 | 225,769 | 18 | 21,499 |
| Sept. | 195 | 165,793 | 103 | 127,682 | 5 | 10,199 |

Source: U. S. Department of Commerce.

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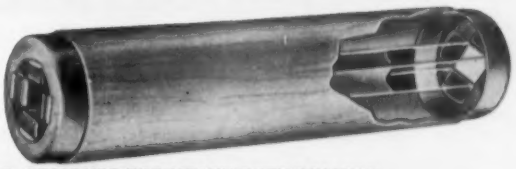

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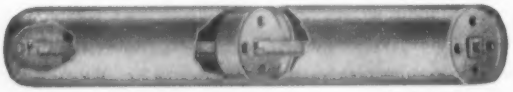

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No. 3 HP Colton, 16 punch, rotary, motor drive 1½ HP.
No. 3 DT Colton, 25 ton, single punch.
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COVERING THE MANUFACTURE OF RUBBER AND RUBBERLIKE PLASTICS PRODUCTS

FEBRUARY, 1957


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